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73 magazine
for radio amateurs

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EDITORIAL BY WAYNE GREEN

JY1 VISITS CANADA

CARF arranges special licensing

Doug Burrill VE3CDC, the Vice-President of the Canadian Amateur Radio Federation, had his work cut out for him getting through yards of official red tape to set up things so His Majesty King Hussein (JY1) could get on the air while on his visit to Canada in mid-August. He did manage this and was able to arrange for a nice letter to be presented to Hussein from the CARF Secretary VE3CRL informing him that this had been set up. You can bet that amateurs around Ottawa and Vancouver, the two major areas that JY1 would be visiting, were keeping their receivers warm.

INVOLVEMENT IS CRITICAL

In talking with FCC officials recently it evolved that one of the more serious problems facing them is the apathy of amateurs in providing feedback on proposed rules and regulations.

Quite a bunch of proposed rule makings and dockets have been released in recent weeks and the FCC not unreasonably expects amateurs to be interested enough to send in their comments on them.

For instance there was a proposal that the prohibition against linking repeaters be removed. Now this has been a sore point with repeater groups ever since the rule appeared in Docket 18803 – not that many repeaters have any wish or need to link up, just that the prohibition didn't make any sense and few repeater groups felt that the restriction did anything but discourage experimentation and initiative. But now that the FCC has replied to these criticisms by offering to delete the restriction, repeater groups have almost totally ignored the whole matter. There are over 1100 licensed repeaters in the country at present and every single one of these groups should move heaven and earth to make sure that their group sends in a comment on every repeater oriented docket and rule making – plus as many individual comments as possible. If the original and 14 copies is just too, too much to handle, at least send in a lousy post card!

The fact is that we take a lot of space in 73 to print the FCC dockets – space that we would prefer to use for a couple more construction projects – but we do it because we know (and you know too) that the only way we will get the rules we want and need is if we keep Washington informed on what we want. When we take the pages to print those dockets it is your responsibility to read them carefully – and further you should make damned sure that they are read at the next club meeting and discussed, complete with a letter from the club secretary expressing the opinion of the club.

Take the Races docket which was published in the August issue of 73 on page 6. Nothing much there that your club would be interested in, right? I'll bet no one even read the docket through to see what was happening – after all, who cares what Races is doing? Well, fellows, the word from the FCC is that you darned well better read that docket and get yourself into gear, for that one is a little sleeper which could have a few thousand non-ham operators sitting there using our ham bands.

This has, according to reports, already been happening in the Chicago area. Races stations have appeared using Races calls and been chatting away happily on two meter FM, telling objecting hams to mind their own business. I wonder how many clubs in Illinois have gone to the trouble to find out what their state has submitted to the FCC by way of comments on the Races docket? Are they aware that Illinois wants to take all those nice ham band frequencies allocated to Races and make them into local government bands? Are they aware that this is the official proposals of their state? That could mean local government use of 2m and 75m! What does your local government intend to do about Races? Many want these valuable frequencies, but don't want to be bothered by having to have amateurs to use them.

In September we had a bunch more dockets – one on special call signs for Extra Class licenses – one on relaxed logging. I assume that virtually everyone likes the idea of simpler logging, but how many have written to the FCC with comments? This could easily end up lost to us because the only ones who bothered to write in happened to be a couple of hidebound conservatives who think that because their grandfathers had to log everything, we should too.

Also in September there was a docket on commemorative stations, one on automatic control of repeaters and one on crossbanding of repeaters. The first one of those will be of little interest to you or to clubs until some time in the future when you decide that it is time to put on a special event station – then? What can I say about repeater groups and FMers who griped about docket 18803, who fumed at the restrictions, and then go happily on their way ignoring the FCC's attempt to put things to rights? You may be sure that there will be a few negative votes cast on each of these dockets – and there is a good possibility that they will carry the day – just because no one else even bothered to send in comments.

SSTV TAPES NEEDED

SSTVers who work up an interesting program are asked to make a duplicate tape and send it to 73 Magazine so it can be further duplicated and used for demonstrations by dealers and at hamfests. There is just too little available that is of value for this application – and remember, the more that we are able to get interesting SSTV programs shown around, the more SSTVers we will have.

A demo tape is available now from 73 for this use, but it is not as long as we would like, and it needs more interesting material – so, how about it?

IOWA FURIOUS WITH FCC

The police in Iowa have been getting more and more frustrated by the use of CB by truckers to thwart the speed limits and other state laws. Recently they got the cooperation of a team of FCC agents and arranged a mass inspection of trucks with CB antennas. The FCC did inspect, but instead of doing anything to help Iowa with their policing problem, all the FCC fellows did was hand out CB license applications to those truckers who had CB radios and no licenses. Iowa figures that by issuing mere warnings instead of taking action against illegal CBers is encouraging illegal use of the CB radios. They feel that truckers will ignore any agency that goes around saying, "Naughty, naughty."

WANTED!

A number of people are most anxious to find out where Keith Lamonica W7DXX (also known as Bob Keith) is located. If you hear him on the air (2m FM is most likely) or hear him announcing over your local radio station, please drop a line to 73

immediately. His last known whereabouts was in Huntsville, where he worked for several television stations. He may be in the Birmingham area – or almost anywhere.

... W2SND

FCC NEWS

Adopted: June 11, 1974

1. Because not all remotely controlled amateur radio stations are additional stations, it is inappropriate to present the rules for remotely controlled stations under the undesignated headnote *Operation of Additional Stations* in Part 97, Subpart D. For this reason, the rules for the operation of a remotely controlled station are relocated, with only minor editorial revision, from §97.108 to a new §97.88 under the undesignated headnote *General*.

2. Because this amendment relates to editorial revisions only, prior notice of rule making public procedure and effective date provisions are unnecessary, pursuant to the Administrative Procedure and Judicial Review provisions of 5 U.S.C. 553.

3. Accordingly, IT IS ORDERED, pursuant to §§4(i), 5(d), and 303 of the Communications Act of 1934, as amended, and §0.231(d) of the Commission's Rules and Regulations, that effective June 21, 1974, Part 97 of the Commission Rules is amended as above.

FCC
John M. Torbet
Executive Director

CB RULE CHANGE

Docket 20118, released July 31, proposes to change the CB rules to prohibit the marketing of external rf amplifiers capable of operating in the 11 meter band. They will prohibit the sale, lease, offer to sell or lease, import or even the shipping of these amplifiers. It would also prohibit the use.

The exception would be rf amplifiers made for amateur radio, and these would have to be multi-band.

The deadline for comments on this Docket is September 30th, which seems a bit too soon. The September issue of 73 (presumably the other ham magazines) had gone to press, which means that the earliest issue which could carry this Docket would be the October issue. In turn this would mean that many amateurs who might like to comment upon the Docket in view of its restrictions on amateur rf amplifiers (though the restrictions are not particularly onerous) will be unable to meet the deadline.

Docket 20119, released July 31, proposes changing the Part 15 (low power unlicensed transmitters) from the 11m CB band (where those little toy 100 mW rigs have been raising Cain, particularly around Christmas before they self-destruct a few weeks later) to a new berth right next to the 6m ham band. The new channels are proposed for 49.9 – 50.0 MHz segment.

If the frequency control of future Part 15 rigs is no better than those of the past (and why should they be?) the 6m ops are in for a lot of garbage on the low end of the band. Of course they may never notice this since the bottom 100 kHz CW band is almost totally deserted, even during the most widespread band openings. There is no reason to expect anything but the cheapest of equipment to be designed and sold for use in this band, so the prospects of wandering carriers is high.

Well, bright-side viewers can look forward to inexpensive hand transceivers which will be easily converted to 6m.

The deadline for comments on this one is also September 30th.

Docket 20120, released July 31, proposes some basic changes in the CB rules. This docket would legislate a changeover to sideband in five years, open up a bunch more channels, and limit CB antennas in many ways, including a 40 Watt power handling capability.

The expansion of the band would add 70 sideband channels and eventually result in 100 channels being available. Antennas would have to be type accepted.

The deadline for comments on this docket is January 30th, which leaves a lot more time than has been left with other recent dockets.

CONVENTION CRITIQUE

The report on the ARRL National in New York which appeared in the Hotline was rather critical of some aspects of the convention – and drew criticism in turn for being critical. The following reprint from the Pack Rats Cheese Bits, the bulletin of the Mt. Airy VHF Radio Club (a consistently well done paper, by the way) is not published here so much to support the Hotline view of the National convention as to provide a valuable set of guidelines for the chairmen of other conventions, for there are some very good suggestions.

A CRITIQUE ON THE NATIONAL

Seven members of Penn ARC and myself, accompanied by WA3PZO drove to the ARRL National Convention in NYC this past weekend. We arrived at 10:00 AM Friday morning staying through until Sunday at 5:00 PM. It was a highly interesting and educational three day weekend. Many good and bad points were noted by our group and are enumerated below for your reference, followed by several recommendations.

All events as listed in the program appeared to be well done, major hangups were not apparent. It is obvious that the Waldorf-Astoria although one of the worlds finest hotels, is not well laid out for a large convention, with miles of carpeted stairways, plush endless corridors, poky elevators, and spotty air conditioning, all popping up in the wrong places. Our Ben Franklin for 1976 will be a much more practical and better suited facility.

Contest Area

Contests were badly neglected with none listed at all in the official program. This could well be a high point for our 1976 convention, as they have been in past years.

Seminars

Many interesting seminars were presented all of which appeared to be well prepared by knowledgeable speakers, however, construction clinics appeared to be missing. Two or three at least would have proven interesting and informative. I would love to see an accomplished homebrewer take a schematic and demonstrate chassis layout, round and square hole punching, soldering etc. Or how about a clinic on soldering co-ax fittings – hardly anyone does it properly. Antenna construction is another. We could go on and on.

Movies/Slides

Except for a private showing of these in one of the hospitality suites none were scheduled. These should be advertised for well ahead of time and

set up in automatic self showing carroselles. Meritorious movies could also be scheduled for appropriate time slots. Always a popular feature at conventions.

Program/Booklet

A glossy paper production with a misleading cover showing a non-existent hotel bearing no relation to the Waldorf — almost a dead ringer for the Ben Franklin in Philadelphia. Content of the program was as bad as the cover. Open hours of the major exhibits were not mentioned once. Consequently many of us (including me) got stranded Friday night with absolutely nothing to do and no way to contact several people we had planned on meeting. The existence of hospitality suites such as Murphy's Marauders, Long Island DX Assn. was likewise not mentioned. No phone numbers were listed for emergency, or even for just plain getting lost in the hotel. Many times it was practically impossible to figure out how to move expeditiously from seminar to seminar, but no one was stationed anywhere who could help.

Miscellaneous Items

1. Bulletin Boards strategically located in (hopefully) pairs, one for official releases, one for delegates personal items — would have been helpful.

2. Convention officials should wear distinctive armbands, not just lapel pins with ribbons as the latter are often impossible to spot.

3. Advance distribution of certain information, such as floor plans, etc., among key delegates should be attempted.

4. No attempt was made to attract young people. Perhaps a reduced rate with local advertising for Scouts in uniform would be appropriate.

5. Location of all meeting rooms should be clearly shown in the Program.

6. Alternate stairways and toilets should be well posted.

7. Parking and shipping arrangements should be published well in advance.

8. A sales pitch for our convention should be staged at the next National convention to attract the undecided. (Reston, Virginia?)

9. 34/94 special repeater on the roof of the Waldorf was a phenomenal success. Everyone who was anyone had an HT on his belt, and when you tested an exhibitors rig, you could hear your voice all over the hotel. HI. How 'bout it Philly? Perhaps we could do them one better with an operating station — all bands. Any volunteers?

10. New York City was like an oversize regional convention, so lacking in imagination and good old convention "hoopla" (Thanks to W3CL for the word!) that I hereby recommend that ARRL appoint a permanent national (volunteer) Convention Chairman to breathe a little continuity into ARRL sanctioned national conventions.

LETTERS

ou goons don't ever proofr
lousy
bunch of rocks
you ignored my
I insist that you print ev

IRS

My son, John Goodwin WA5ZEK, is a subscriber to your magazine. Since 1954, I have been involved in the preparation of Federal and State Income Taxes. In that time, income tax has grown from nuisance to tyrannical proportions. The people for whom I prepare taxes are primarily working people, wage earners. Income tax is withheld from their wages along with FICA. In our area, a working couple can earn from $10,000.00 to $18,000.00. It is alarming the total taxes withheld from their wages and I grow more angry each tax season, and have cast about as to how I could encourage people to object. Most people are mortally afraid of the IRS as you have pointed out.

It never occurred to me to read "73" for tax information. John called my attention to your articles which I read with eagerness and approval. I am eager to participate in anyway to bring about tax reform, and am open to any suggestions you have to offer. Primarily, the people who feel the same as you and I lack the leadership to act. If you can contact people in my area who are able to assume leadership and bring about organization for concerted action, it would be a step in the right direction. Our first major objective should be removal from office of our own Wilbur Mills, who, as you know, is chairman of the powerful Ways and Means Committee. He is up for election this Fall. Since we were able to topple our Rhodes Scholar in the primaries, it is not too far fetched to think we might displace our Mr. Mills.

The time for action was yesterday; keep the good work going.

Bernice Goodwin
Fort Smith, Arkansas

TAPES GREAT

I have received your 4 code tapes. They are the best yet. I'm using mine for brush-up and they sure fill the bill. I now feel I can build up my speed.

C A. Apland W7ZJC
Lynnwood WA 98036

CASSETTES GREAT

I have your cassette recorder and it works every bit as well as my daughter's, which cost several times more. I still think 73 is the best place to look for anything you might want for a ham.

Edward Seidel, Jr. WA8HGS

DO IT YOURSELF

Bill Hoisington's article "An Automatic and Phone Monitor Control System" in the February 1974 issue of 73 really sparked my imagination. As a result, I would like to propose another project which I am sure would find universal appeal among your readers.

My do-it-yourself construction article involves a small superconducting coil which can be inserted into the electric power meter through the short piece of large conduit between the power meter and the circuit breaker box. Whenever the amateur station is transmitting, a broadband detector turns on a circuit which applies power to the superconducting coil. This produces a strong magnetic field which opposes the field inside the motor of the power meter and stops the meter. A detector circuit, using field effect transistors, measures the amount of current being delivered by the power meter and a control circuit adjusts the magnetic field to just the right amount to stop the meter. The superconducting coil takes quite a large amount of power, but this doesn't really matter since the meter is stopped anyway. Of course, I will absolve the 73 Magazine, its editor and myself of any responsibility by inserting a warning, near the end of the article, that the power company might get a little upset if the meter is stopped when the meter reader happens to come around.

Perhaps this article will spark some other amateur into thinking up a way to use amateur radio to stop the natural gas meter. This will be a little more difficult since this meter does not work on electricity, but some smart ham will surely come up with the answer. From there it would be an easy step to make a unit to work from a mobile rig to stop the meter of a self-service gasoline pump after you have pumped in the first five gallons.

Just think how proud 73 Magazine

could be for publishing detailed instructions on how to use amateur radio to save its readers thousands of dollars which would otherwise have to be paid to these giant industries.

I am awaiting instructions on how to submit the manuscript.

James E. Dalley WØNAP

This is just the sort of innovative engineering amateurs have been noted for down through the years. Yet, one wonders at your lack of creative imagineering in this case – why not go all the way and run that power meter backward so you can get a monthly check from the power company to help you buy a little more ham gear? Doubtless there would eventually be some questions raised, but these would be easily brushed off by the simple explanation that you are merely converting all that radio energy you attract with your antenna back into the power lines and thus conserving energy. What could be more American?. . .ed.

FAN MAIL

For years you have subjected readers of 73 Magazine to your paranoid accounts of your mistreatment at the hands of various parties. Most recently, your principal tormentor has been the IRS. And everyone knows how they use their Gestapo tactics to pursue and persecute the pure of heart!

It has been difficult for me, and I'm sure many other readers, to understand why you have always been the innocent victim of such unwarranted attacks. We have also wondered why you think your personal problems have any place in an Amateur Radio journal.

But now that you have been tried in a Federal court and found guilty, maybe all this will change. "Guilty on twelve counts of tax evasion for signing false returns," the jury said. Not the IRS, nor the FCC nor the ARRL nor the Gestapo. No, Wayne, this was the verdict of 12 good, old Yankee Granite-Staters down Concord way.

If and when you get out of jail why don't you apply for a First District call, like all other New Hampshire residents, confine your efforts to putting out a decent magazine and spend a little time with a good doctor to help clear your mind.

You know, Wayne, all your supposed enemies don't really hate you. This is another of your delusions. The truth is that most of us just feel sorry for you and wish that you had taken up fishing or music. With friends like you, Amateur Radio doesn't need enemies!

John Naylor K6BR
485 Pullman Road
Hillsborough CA 94010

GOOD WORK

Keep up the good work – Ham Radio needs you more than ever –

Rich W8JS
Oregon WI 53575

CODE TAPE

I want you to know that with the help of your code course (5WPM) I passed my code test with only one wrong letter, A C came out N N. I owe it to you and that code tape. . . I'll recommend that tape to anyone that want's to get their Novice ticket.

I also say let's send Wayne Green to Washington as our Amateur Radio Lobbyist. We need you.

Marvin R. Bittner
Jacksonville KY

BOOKS

Serious, qualified, intelligent hams interested in vital fundamentals of life should read the "Fields of Life" by Dr. Harold S. Burr, Ballantine paperback 23559 $1.50 and/or "Design for Destiny" by Ed. W. Russell, Ballantine 23405 $1.25 and then develop suitable direct current amplifiers that are stable so that these Fields of Life can be measured in millivolts with an extremely high input resistance.

Applications are in family planning and as an indicator of disease. It gets down to what really makes us tick and where we go from here. From Ballantine Books Inc., 201 E. 50th St., NYC 10022 plus two bits postage per order.

Charles A Moore XE1CMB

CANADIAN OPERATION

Why leave Amateur Radio behind when you go to visit Canada this year?

Getting a reciprocal license is easy to do. Send a letter for application to: *Department of Communications, 55 St. Clair Avenue East, Toronto 290 Ontario, Canada.* Give them your name, address and class of license. You'll get fast action.

Leo WA1HSO

THOUGHTS ON LICENSING

I've been thinking out licensing changes for hams ever since you discussed the question in July '74 issue of 73.

When you analyze the reason for existence of the spectrum the ham allocations you know damned well that hobbyists couldn't hold such an asset by themselves. I keep recalling what Budlong said in a Seattle talk years ago, "We couldn't hold our bands 5 minutes by ourselves – they're reserved for military emergency use and we simply occupy them until they're required." I'm sure that's correct, although I've never seen the statement in print.

Parenthetically, reflection on that statement amuses the hell out of me when I see how seriously some hams take ourselves and our hobby. Picon, indeed!

Well, to go on. That being the case that we're only keeping the house dusted until the owner returns, it seems obvious to me that the military wouldn't want the ham bands tenanted by a huge group such as sits on the citizens band – they'd simply be too large and too strong politically to dislodge easily when the bands are required in an emergency.

So – the present licensing requirements keep the bands fairly active, but not over active nor politically strong, and most hams have a conscious desire to do the right thing for others, and I'm sure very few would operate illegally if the military needed the bands back. So maybe we ought to leave the licensing system the way it is with only minor changes.

Of the minor changes I think ..centive licensing is foolish. It reflects more of the 'taking ourselves too seriously' attitude. And maybe the higher frequencies should have less vigorous code requirements.

John W7SCU

TWO METERS

First of all, thank you for the subscription/books to be used at our hamfest in August.

I know what I am about to say has been said before, but it seems to need repeating again, and again, and again. . . Those who operate 2 meter FM continually mess up on proper identification, operation, etc., etc.

The Ten Commandments of Two Meters

I. Thou shalt not make unidentified transmissions (i.e., keying a repeater just to see if you are making it).

II. Thou shalt not pick up another's transmission without a two second pause (quit tailgating – breakers may need the repeater for an emergency).

III. Thou shalt always include the proper region number when mobile or portable (i.e., mobile two; portable five).

IV. Thou shalt identify correctly (i.e., the other guy's call and then your call – and only once every 10 minutes).

V. Thou shalt support thy own repeater for thy usage (no one likes a freeloader – be a supporter).

VI. Thou shalt not hog or abuse another's repeater when visiting in another's area (you are usually welcome, but be a listener more than a user).

VII. Thou shalt not mimmick the repeater's identifier (one need not give the repeater's call or frequencies when listening rpt. or clear rpt. is sufficient).

VIII. Thou shalt not time-out a repeater (no one likes a gabber – it is unnecessary, rude, and ties up a repeater for others – go back to 80 if you must have "gallopping gums").

IX. Thou shalt watch thy deviation (some machines do only accept 5 kHz).

X. Thou shalt watch thy frequency (check your jap-track and clegg once a month and keep it working within a kHz or so).

There are many more, but these are the real problems – the ones that drive control stations "bananas"!!!

Ronald W. Perry WA2CGA
Trustee WR2ABB/W2CVT/WA2MRQ

Cont'd on p. 135

F.C.C. BOONDOGGLING

or

F.C.C.

where were you when we needed you?

Submitted by
W. H. Solfermoser KØDVI
1905 West Lake Street
Ft. Collins CO 80521

The following story contains my comments concerning my attempts, as the Trustee of the Northern Colorado Amateur Communications Association, Incorporated (NCACA), to obtain an amateur repeater license for NCACA in accordance with the newest Federal Communications Commission (FCC) Rules.

The NCACA was granted an amateur repeater license with the call letters WAØVVX on November 24, 1971. Operation of the repeater began on December 23, 1971.

In 1972 the FCC began promulgating new repeater rules as a result of the Docket 18803. Three definite deadlines were established by the FCC:

1. October 17, 1972 – date by which all existing repeater stations were required to meet the new rules' requirements to the best of their ability.

2. April 30, 1973 – date by which all existing repeater stations were required to submit new applications for new licenses in accordance with the new rules.

3. June 30, 1973 – date by which all existing repeater stations were required to go off the air if new licenses were not obtained. (This deadline has been extended.)

The NCACA submitted its application for a new repeater station license on April 27, 1973. The application described the existing operation of WAØVVX as modified to conform with the new FCC rules. It was the belief of the NCACA that the application outlined operation which was in full compliance with the letter, and the intent, of the FCC Rules.

The NCACA application was processed by, and rejected by, Mr. Robert Kite of the Washington FCC office.

The notes which accompanied the rejection led me to believe that the application may not have been studied in detail. Some questions asked by Mr. Kite were answered within the application. Some suggestions given by Mr. Kite for modifying the application appeared, to me, to be more nearly personal interpretations than official interpretations.

For example: Mr. Kite stated that amateur repeater Control Stations should be equipped to self-identify in Morse code at a speed of not less than twenty words per minute to make unauthorized determination of the Control Station's identity difficult. While I appreciate his concern for maintaining control link security, I find it necessary to make at least three observations:

1. The identity of a Control Station need not be as secure as the control coding of the Control Station. Anyone having the ability to listen on the control frequency might reasonably be expected to have the ability to employ fairly elementary recording-and-playback techniques to determine the content of Morse code at any transmitted speed. Also, it appears rather inconsistent to attempt to hide the identity of a Control Station when transmitting, but to require the posting of Control Station data at the repeater site.

2. The FCC Rules make no mention of such specific identification requirements. (Identification of amateur radio stations by amateurs has been with the intent of easy identification by the listener, historically.)

3. Although I have made a point of discussing the repeater application situation with every other amateur I have met, I have yet to find anyone who considered 20-wpm identification, who made that a part of his application, who was rejected because of his failure to include it.

Mr. Kite stated in his rejection notice that the NCACA had thirty days in which to re-submit the application without losing its place in the FCC queue.

The application was modified extensively in order to satisfy Mr. Kite's requests, item-by-item, and was mailed to the FCC on June 18, 1973 – within the thirty day period.

The NCACA, as an organization, and the Board of Directors, as individuals, have repeatedly expressed publicly their intent to operate NCACA stations in such a manner as to guarantee full compliance with the letter and spirit of the law, and to set an example of such operation to any amateur which might come into contact with NCACA. Therefore, after much discussion of the new repeater rules and the comments in the rejection notice, it was decided that we would rather shut down the repeater in view of a possible discrepancy in our interpretation of the FCC Rules and Mr. Kite's. It should be stated, however, that at no time have we believed that any of the actual, or proposed, operation of the WAØVVX repeater was in conflict with the FCC Rules' letter or intent or spirit.

With great reluctance, WAØVVX was removed from operation when the June 30, 1973 deadline arrived.

Knowing that the FCC was undoubtedly swamped with repeater applications, and having faith that the applications would be processed as expeditiously as possible, we remained off the air without bothering the FCC for quite some time.

On August 31, 1973 I called Mr. Kite. I told him I did not wish to seek special treatment, but that I wished to find out whether our application had been processed, or get an estimate as to when it might be processed. Mr. Kite informed me that he was no longer involved in processing the repeater applications; he had been loaned to that area only during the rushed period when our application had originally arrived.

Mr. Kite appeared to remember our application and stated that it would be processed "in due course" by Mr. Ferraro. He cautioned me that Mr. Ferraro would not be able to discuss it with me. He defined "due course" to mean approximately one to two months. He suggested that if I had not received any word concerning the application within that time period, it might be appropriate to call Mr. Ferraro at that time.

I told Mr. Kite that there was one other aspect of the NCACA application I was concerned about: two of the Control Station applications in the repeater system application were for licenses which expired during the month of August. I was told that the FCC Rules were explicit in stating that one may operate beyond the stated expiration date provided that "timely application for renewal had been made to the FCC" and that this requirement had been met.

Referring back to the repeater application, Mr. Kite did not wish to discuss any of the particulars of the application nor did he wish to discuss any of the points for which he had rejected it earlier. My impression was that he was relieved to be no longer involved with processing repeater applications.

After waiting several weeks, I called Mr. Ferraro on the morning of November 13, 1973. I told him that I did not wish to seek special treatment, but that I was becoming concerned that our application was lost and might, therefore, never get looked at. I also told him that my concern was deepened by the fact that we, as NCACA, had chosen to go off the air

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Ed Note: Despite some glitches such as this, the FCC has managed to license some 1100 repeaters! Much bravo to Gary Hendrickson W3DTN, repeater operator, for joining the FCC and getting the work done.

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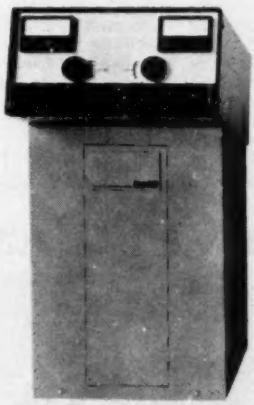

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rather than be, or even appear to be, in violation of the FCC Rules.

Mr. Ferraro agreed to look for the file. After several minutes he returned to the phone to state that he could not find the file. He suggested that perhaps I should re-submit an entirely new application since it was "probable that the application had been lost in the mails." I informed him that I had in my possession the postal receipt stating that the application had been received by the FCC on June 20, 1973. He then had me talk with Cathy Adams who is, apparently, a recording secretary. She agreed to look for the file, but came back to the phone later to say that she could not find it and that she would call later that day.

She did call late in the afternoon to say that she still could not find it; that she had the Gettysburg office looking for it also; that she would continue looking and would call me the next day.

Cathy called the next day (November 14, 1973) and said she had found it. She said she was not permitted to make an estimate as to when it might get looked at, but that I could talk with Mr. Ferraro about that.

Mr. Ferraro said he was not permitted to make estimates, but that it would surely be looked at during the month of November. I stressed again that we at NCACA were off the air waiting for a decision.

On December 27, 1973 I called Mr. Ferraro. He did not appear to recall having ever talked to me before. I read to him extensively from my notes made during the telephone talks of November 13th and 14th. He agreed to look for the application and to call me during the first week of 1974. No call was ever received.

In mid January 1974 delegates from the Colorado Council of Amateur Radio Clubs, Inc., on behalf of the more than twenty amateur radio clubs and repeater groups they represent, went to Washington, D.C. where they expressed their views concerning the incompetent actions of the FCC in regards to amateur radio repeater licensing.

The meeting lasted two hours. There was an ARRL representative present along with thirteen amateur representatives. Commissioners, Lee, Reed, Burch, Hooks, and Wiley were present as was most of the necessary FCC staff. Almost as in anticipation of this meeting the FCC had already released an order relaxing certain amateur repeater rules. This meeting seemed to bring about fast action for the Northern Colorado Amateur Communications Association, Inc. After almost eight months of waiting we received the call WRØADD.

However this was only a good start. Even though those certain repeater rules were relaxed our application was predicated on the more stringent interpretations of the FCC staff earlier.

As of August 1, 1974 NCACA is still trying to comply with the letter and spirit of the law before placing its repeater on the air. We haven't succeeded, yet!

Clyde E. Glass
Trustee, NCACA

QSL CONTEST

DARC

D A 1 M K

B 11

Mike Kaul DA1MK wins the one year subscription this month with this striking woodcut of his home town, Nürnberg, Germany. Keep sending your entries to 73 Magazine, Peterborough, NH 03458.

Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA 91402

This is getting to be an expensive habit. Here I am again, "flying the friendly skies of United," heading West. I've been back in the "Big City" the past week and a half for a very special event. About 72 hours ago, my brother Bob and his new bride Rose vowed everlasting love to one another and began their married life together. This was one event that I could not miss, therefore, the trek 3,000 miles east. It was a beautiful wedding, but now I am heading back to the place where I belong. More important back to Sharon, the person whom I belong with. Its been a long week and a half, but a good one. More about the trip later, but for now, let's talk about the latest addition to the LA two meter FM scene; an open autopatch repeater.

Credit for WR6ACK must be given to its builder Doug Andrews K6VGH. Though ACK, which operates 147.93 in, 147.33 out was designed primarily to cover the West Los Angeles area, I have been told that stations as far away as San Diego have been able to make it into the machine. ACK is a split site operation with the receiver located atop Mar Vista Hill and the transmitter in Santa Monica atop the General Telephone Building. This combination seems to give good coverage to its prime intended coverage area. The autopatch facility is intended for general use with but two built-in restrictions. A "dial restrictor" limits the system to non-toll type calls and if you are long winded, thereby exceeding the three minute timer, your call will be terminated for you. The only other rule is the one that applies to all Amateur Autopatch Systems. Under no circumstances is the system to be used to conduct business of any type. In plain English that means its fine to make any kind of personal calls you wish, but calling your office for messages from your secretary is a strict no no!

In your editors opinion, WR6ACK is more than just another repeater, one having autopatch facility. I kind of view it as an experiment to see if such a system can survive in an urban

area the size of Los Angeles. If everyone shows cooperation and abides by the rules other such systems might eventually get put on the air. On the other hand, if the autopatch privilege is abused; if those that use the machine don't support it, it might have to go away. Putting an open autopatch on two meters is a big risk here in LA, but someone has to be first. My congratulations to Doug for being #1.

Mention "Star Trek" and you get more mail than you can hope to answer in a dog's age. That's what happened soon after the July column came out. No, I have no idea if Star Trek will ever be revived as a new series, but I wouldn't mind seeing it happen. From your letters I can assume I am not alone, but realistically, I seriously doubt if this will ever happen. Ah, but those re-runs were great till KCOP took them off the air. Must have seen each one fifty times or more. Gene Roddenbery and his staff were truly people ahead of their time.

KPFK's "Hour 25" on the other hand is "live and well" here in Los Angeles, every Friday evening at 11 PM Pacific time. Unfortunately, to those of you who asked, Hour 25 is heard only in the area covered by KPFK's 110,000 watt ERP signal, eminating from atop Mt. Wilson. (Remember that picture I ran some months ago of WR6ABE's new antenna installation? The antennas just below ABE's Stationmaster are those of KPFK.) This three hour program, conceived and produced by Mike Hodel who acts as co-host along with Cathy Calkin and John Henry Thong (Mitchell Harding's alter ego after passing through his Universal Rotator) is to my knowledge the only show of its type anywhere in the country; a program devoted exclusively to the world of Science Fiction or scifi (pronounced skif-fe). This is made possible by virtue of KPFK being a non-commercial, listener sponsored station thereby negating the need for commercials and the people that pay for them. There are no promo's heard during Hour 25 or any other KPFK program for that matter. No offense to the big three in broadcasting, but I prefer my programs that way.

On a typical evening with Hour 25 you might hear a live interview with such notables in the scifi world as Theodore Sturgon or Harlan Ellisson followed by open telephones so that the audience can take part in the interview process. This might be preceeded or followed by reports on scifi conventions throughout the country and the program usually concludes with a taped reading of a piece of scifi work. The open telephone technique is also used to permit the audience and the hosts to discuss just about any aspect of scifi that you can think of, that in itself is making for an interesting program. PS – That should have been "EQUICON" rather than ECLICON.

I found out about Hour 25 while interviewing Mike Hodel for a future 73 article I am writing on Pacifica Radio and freely admit that I have been hooked on it ever since. To those of you scifi buffs that might be here in LA some Friday evening and are tuning your FM broadcast radio around 90.7 when you hear some strange music followed by an eccoey voice saying "This is Hour 25, the science fiction – science fantasy program," stop tuning. You have just entered the world of Hour 25.

To my many friends in the metro-New York area, it was great to see so many of you and especially those of you at the LIMARC meeting. Though the evening was hot and humid, and this was my first time as a guest speaker anywhere. The people that make up the Long Island Mobil Amateur Radio Club were a fantastic audience and went out of their way to make me feel at ease. I sincerely hope that you enjoyed my presentation and films as much as I enjoyed presenting them. For me, it will be an evening to remember. Special thanks to Bob Reed WB2DIN and Lou Belsky K2VMR for handling all the arrangements, providing transportation and for that great corned beef on rye. One final and very special thank you to Myrt Billings W2BIV for some help of a type that only he could give. It was a good trip, but this 747 will be landing in a few minutes and I will be home. LA may be a great big freeway, but it's good to see the I-405 again.

Finally, just as I was about to wind "LW" u for this month, I spoke with Capt. Dick McKay K6VGP and learned that he had submitted to the FCC a petition for rulemaking to permit fully automatic remote control over all repeaters. Needless to say, that this petition should it be adopted by the powers that be in Washington would be the kind of step in the right direction that is necessary to further stimulate the growth of repeater systems throughout the country. Therefore, we at LW fully support the work that Dick is doing on behalf of all amateurs and sincerely hope that the FCC will adopt his petition. Next month we will discuss this petition in greater detail. **...WA2HVK/6**

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

WB4OSN, who finally worked W7UBI, Idaho for state number 47, also mentions working TI2NA, TI2HL and TG9KJ. Joe says in part "TG9KJ has been putting in a nice signal running 10W into a 6 element at 85 feet. If you hear TI2NA's beacon, also look for Luis around 50.075. He is usually on CW and sometimes AM. QSLs for TG9KJ go to P.O. Box 115, Guatamala City, and don't forget an IRC or two."

Have had some correspondence with TI2NA which clears up the situation there. The beacon runs 40W to a dipole radiating North-South on a 24 hour basis. Erik originally intended listening on 50.250 but discovered no problem on 50.150. He says "I am sure you will get lots of reports that the beacon has been heard but my receiver on 50.150 fixed is not that sensitive and I have the problem that if the station is off frequency it is unintelligible but that will advise me that there is an opening." Erik also says "TI2HL (formerly OA4C) is in Costa Rica and active now on 50 MHz. His prime frequency is 50.110

TI2NA, the highlight of the 6 meter season. Erik works all bands from 160 through 432. You will most often find him on 50.150 or 28.600.

repeater update

Revision of Recently Published Repeater Atlas

INDIANA

WR9ACI	Anderson		6.22-6.82
WR9ADJ	Bloomington		6.04-6.64
WR9ABD	Evansville		52.920-52.575
K9OET	Ft. Wayne		6.31-6.91
WR9ADI	Ft. Wayne		6.16-6.76
WR9ACJ	Ft. Wayne		6.28-6.88
			449.8-444.9
WR9ACU	Indianapolis		6.28-6.88
WR9ACZ	Lafayette		6.16-6.76
WR9ACX	Marion		6.19-6.79
WR9ADD	Michigan City	T1.8	6.37-6.97
WR9ABO	Muncie		6.13-6.73
K9FAP	So. Bend		6.34-6.94
	So. Bend		7.99-7.39

IOWA

WR9AEH	Cedar Rapids	T2.0	6.16-6.76
WA9VWI	Cedar Rapids		7.90-7.60
W9LAC	Burlington		6.19-6.79
K9GVP	Creston		6.19-6.79
WR9AEB	Davenport		6.04-6.64
WR9	Davenport		6.28-6.88
W9DYS	Marshaltown		6.28-6.88
WR9ACF	Spencer		6.22-6.82

KANSAS

W9IPB	Hutchinson		6.22-6.82
WR9ADH	Kansas City		6.13-6.73
WR9ABT	Kansas City		6.19-6.79
WA9VVB	Kansas City		6.37-6.97
WR9	Kansas City		7.93-7.33
WR9AEI	Kansas City		6.34-6.94
WR9ABJ	Kansas City (RACES)		5.665-7.21
WR9ABV	Kansas City		52.88-52.525
WR9ACW	Norton		6.34-6.94
WR9ACI	Plainville		6.28-6.88

KENTUCKY

WR4AET	Paducah		6.16-6.76
WA4YZY	Pineville		6.22-6.82

LOUISIANA

WR5ACN	Alexandria		6.34-6.94
WR5	New Orleans		6.01-6.61
WB5FXF	Ruston		6.34-6.94

MAINE

WR1AOS	Mt. Buckfield		6.28-6.88

MARYLAND

WR3	Baltimore		7.84-7.24
WR3ABQ	Baltimore		6.07-6.67
			444.35-449.35
WR3	Cambridge		6.40-7.00
WR3ABL	Frederick		6.13-6.73
WR3ABM	Gaithersburg		6.04-6.64
WR3ABT	Hagerstown		6.34-6.94
WA3DZD	Harmans		6.16-6.76
			444.10-449.10
WA3SFJ	Havre de Grace		6.25-6.85
WR3ACL	Severna Park		6.16-6.76
WR3ACK	Silver Spring		448.00-440.00
			444.00-449.00
WR3ABW	Silver Spring		6.25-6.85
WA3BMM	Washington D.C.		53.25-52.68
WA3PVP	Wheaton		6.07-6.67
			223.38-224.38
			448.38-449.38
WA3BMM	Wheaton		53.25-52.68

MASSACHUSETTS

WR1ACP	Agawam		6.40-7.00
WR1ACB	Bellingham		7.66-7.06
W1UQ	Brookline		CLOSED
WR1ADC	Fall River		6.43-7.42
WR1ABI	Fall River		52.01-52.70
			6.19-6.79
WR1	Falmouth		6.25-6.85
WR1ABK	Foxboro		6.355-6.955
WR1ABZ	Holliston		53.84-53.04
			6.385-6.985
			442.00-447.20
			22.30-22.90
WR1ABX	Holyoke (Mt. Tom)		6.34-6.94
K1FFK	Mt. Greylock		6.31-6.91
WR1ADU	Mt. Lincoln		6.13-6.73
WA1KFZ	No. Adams		6.43-7.03
WR1ABW	Somerset		442.75-447.75
WR1ADC	Somerset		6.43-7.42
WR1	Springfield		6.16-6.76
WR1ABO	Worcester		6.37-6.97
			53.72-53.12

MICHIGAN

WR8AEC	Birmingham		CLOSED
WR8ADF	Clarkston		6.25-6.85
W8IQZ	Crystal Falls		52.76-52.525
WR8ABN	Detroit		449.00-444.00
WR8ACN	Grand Rapids PL	T2.15	6.16-6.76
WR8ADJ	Holland		6.28-6.88
WR8ABK	Jackson		6.16-6.76
WR8ABI	Kalamazoo		6.19-6.79
WB8CQM	Lansing		6.34-6.94
			6.22-6.28
WR8	Lansing		7.81-7.21
WB8CRQ	Ludington		6.34-6.94
WB8CRQ	Manistee		6.19-6.79
WR8AAA	Milford		6.19-6.79
WR8	Mount Clemens		6.07-6.67
WB8FNM	Mount Clemens		444.90-449.90
WB8BRA	Owosso		449.30-442.10
WR8ACS	Rochester		7.69-7.07
WR8	Sault Ste Marie		448.75-443.75
WR8	Traverse City		6.25-6.85
W8FGB	Tronary		6.16-6.76
WR8ACY	Whitmore Lake		6.07-6.67

MINNESOTA

W9GKO	Duluth		6.16-6.76
WR9ACN	Faribault		6.19-6.79
W2NSD			7.75-7.15
WR9ADP	Marshall		6.16-6.76
WR9ADY	Minneapolis-St. Paul		6.25-6.85
WR9ADT	Minneapolis-St. Paul		6.07-6.67
WR9AFG	Minneapolis	T1.8	7.75-7.15
WR9	Minneapolis-St. Paul		6.16-6.76
WR9ADM	Minneapolis-St. Paul		7.69-7.09
WB9BZC	Minneapolis-St. Paul		448.75-443.75

MISSISSIPPI

W5CSH	Crystal Spring		6.22-6.82
WR5ADC	Pascagoula		6.28-6.88
WR5	Vicksburg		6.34-6.94

MISSOURI

WR9	Bolton		7.72-7.12
WR7ADY	Billings		6.34-6.94
WR9	Columbia		6.01-6.61
WR9	House Springs		7.69-7.09
WR9	Jefferson City		6.40-7.00
WR9ABT	Kansas City		6.19-6.79
WR9AEI	Kansas City		6.34-6.94
WA9VVB	Kansas City		6.37-6.97
WR9ABJ	Kansas City (RACES)		5.665-7.21
WR9ABV	Kansas City		52.88-52.525
WR9	Kansas City		7.93-7.33
WR9ACC	St. Louis		52.25-52.80
WR9ADV	St. Louis		6.37-6.97
WR9ADB	St. Louis		444.50-449.50
W9EEE	Rolla		6.28-6.88

MONTANA

WR7ADY	Billings		6.34-6.94
WR7ADN	Bozeman		6.28-6.88
WR7ABY	Butte-Anaconda		6.34-6.94
WA7QAA	Great Falls		6.280-6.880
WA7KZZ	Helena		6.16-6.76
WA7KZM	Missoula		6.16-6.76
WR7ADO	Sweetgrass		6.34-6.94

NEBRASKA

WR9ACZ	Scottsbluff		6.34-6.94
WR9AEA	Columbus		6.04-6.64

NEVADA

WR7ABB	Las Vegas		7.18-7.84
WR7ABI	Reno		6.34-6.94
			6.34-7.48
			6.94-7.48

NEW HAMPSHIRE

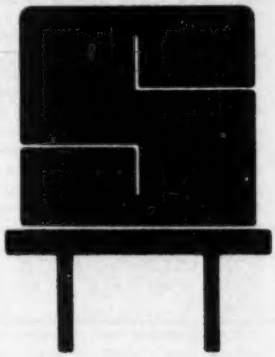
WR1ABU	Concord		6.34-6.94
			444.55-449.55
			53.88-53.08

NEW JERSEY

W2FLY	Camden		6.22-6.82
WR2ADD	Cherryville		7.975-7.375
WR2ADB	Denville		6.385-6.395
WR2ABM	Ford		447.40-449.40
			6.22-6.82
W2SJT	Harmony		6.22-6.82
WR2ADO	Montclair		7.945-7.345
WR2ADV	Paramus PL		6.19-6.79
			448.10-443.10
WR2ADQ	Ridgewood		448.55-443.55
WR2ADJ	Sayreville		6.16-6.76
WR2AEE	Somerville		7.855-7.255
WR2ADE	Trenton		6.07-6.67
WR2ACY	Whippany		7.63-7.03
WR2	Woodcliff		6.355-6.955
			6.19-6.79

MORE NEXT MONTH

Send any and all corrections, updates or new listings to 73 Magazine, Peterborough NH 03458.



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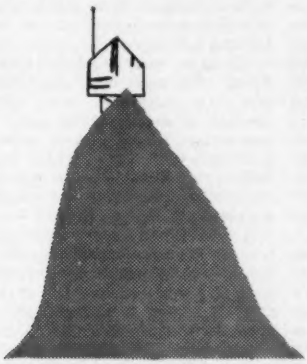

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and sometimes he runs his own beacon." Erik lists a number of stations worked including WB4PXW, W2REB, WA4EFB, W3BWU, K2ZYX, W5WAX, K8MMM, K7PXI, XE1GE and KØHHB.

SMIRK had 466 members in 44 states as of August 1st. Membership applications should be sent to Ray Clark, K5ZMS/5, 7158 Stone Fence Drive, San Antonio 78227. Ray says he heard TG9KJ on CW the 9th of July, XE1GE and XE1FE also CW on the 10th and passes along that Joe WA5HNK heard LU3EX on CW the 12th. 'Bert, K5HVC told me he heard an Anchorage, Alaska butane gas company testing their transmitter at 0230 this morning (July 26th) on 49.955 for about 35 minutes." Ray says JA1RJU has sent in his membership application, Kazuo is editor of Japans "CQ Ham Radio" magazine.

The (Indiana) 6-6 Club is now at 126 members and still growing rapidly. The first gold star for working 25 members went to WA9MEM. Congrats Mike!

Did you work WØNRI/Ø/7 on the Wyoming/South Dakota line during the June contest? The many who did appreciate the effort expended in getting the camper properly positioned.

The East Coast VHF SSB Net meets at 1500 CUT Sunday on 50.175. Ray K2EGH is net control for this fine group.

WA1EXN worked TI2NA on July 2nd, and enjoyed every second of it.

On several occasions I have been requested to mention the desire of one group or another to make schedules for a particular contest or activity. I am more than willing to do this if the information is received early enough. The most recent request is typical of the problem. The request was mailed July 25th, the deadline of the next column was August 10th. This column was for the October issue, which is distributed in late September. Unfortunately the contest in question will have been completed two weeks before publication. Please allow enough lead time on requests of this sort. **WAØABI**

SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

The enjoyment in seeing pictures of the fellow operators you contact, their family, rigs, even pet projects slowly unfolding down an SSTV monitor screen is rather difficult to describe. SSTV permits QSOs to be more like an actual visit than just a quick chat. What do you do when you visit one of the local gang. . .look over the rig, start discussing new ideas and draw up some sketches or, if it's electronic, maybe block diagrams or schematics for mutual discussion? Sure. . .it's just typical "ham" nature. What better reason could we have for SSTV! Slow scanners naturally become a rather close knit group because they have an additional means to really learn about each other. During picture transmissions a Slow Scanner might reveal his interest in, say, vintage automobile restoration, only to find one or two of his viewers also automobile enthusiasts. Following QSOs would naturally lead to the "look what we ran across when. . ." bit followed by pictures and ideas many magazines would relish.

Slow Scan TV reminds one tremendously of early ham radio days when operators built and tried practically anything reasonable. Further, these early ham operators seemed to all know each other personally because of the common "wireless" link and the time they took to actually communicate with each other. Why should we, in this modern age, contact someone thousands of miles away and then stare inadvertently at the receiver dial or speaker trying to visualize them? Just as commercial TV filled the void of early radio programs, SSTV can fill the void of audio only QSOs. Today's SSTV operators are modern day pioneers who want to share their enthusiasm. Slow Scan TV is a wide open field of tremendous fun, where major advancements are still being made on an individual basis. (Manufacturers are having difficulty keeping up with us!) Why not join in the excitement. It is, indeed, amazing to see pictures of a beautiful sunset across Africa's plains from ZS3B, a live volcano from Z2AAV or a Tasmanian Devil from VK5BS one night and Israeli IDs, some beautiful girls or even schematics of new circuits the next night.

No longer must amateurs be concerned with only their voice; now they must watch their looks! Your physique is on the air, old boy! "Is that a beard you're growing, or just poor lighting?" "Hey — didn't you forget a neat shirt?" "Look at my new linear!" That's just part of the exciting new world of Slow Scan TV.

If you're not into SSTV now (. . .maybe you're looking over this column out of curiosity) why not make it a point to visit one of the SSTVers in your area and judge for yourself? If you are an active SSTVer, why not offer to give a SSTV demonstration for your local club. Either way, I'm sure the results will be gratifying. Should you be interested in homebrewing a simple SSTV viewing adapter with a minimum of cash outlay, consider the oscilliscope viewing adapter described in June, 1970 QST. It makes an ideal "Beginning SSTV" project.

Hams are not the only ones finding SSTV a useful communications tool. Schools and hospitals are now considering it as a mass instructional means. One of the more popular methods is to lease an FM stereo station's subcarrier for transmitting the SSTV, then to use a subcarrier receiver "in front" of a SSTV monitor (or scan converter) for reception. As I mentioned a few months back, commercial scan converters are still using scan converter tubes, and prices are quite high. Commercial MOS Shift Register type scan converters are presently not economically feasible. Police departments are also finding SSTV very useful. Using SSTV, positive identification of a suspect can be made from a patrol car before arrest thus preventing any possible countersuit due to mistaken identity. Gee, before long police cars may be a rolling SSTV studio! I suspect a snap on camera adapter would be advantageous for daytime use, or "mugshots" dispatched to units. However, SSTV is still less expensive than faxsimile units some cities considered using.

This month's SSTV picture is compliments of George WB9LVI, and points up a slogan that's growing in popularity. The picture was scan converted from Slow to Fast using his digital converter, which does quite a good job. If it seems like I'm pushing this month to get others interested in SSTV, you're right. We SSTVers have a grand thing going. Remember, newcomers are vital to the growth of Slow Scan, and the more there are the more we all have to share.

The WØLMD Fast to Slow Scan converter described in last month's 73 is destined to be a SSTV classic. This is the "black box" unit that connects to any regular Fast Scan camera (like those inexpensive closed circuit jobs) and outputs with SSTV. No modification to the camera is required. . .just plug it in and go. No doubt this unit will prove a real advantage to SSTVers. Possibly your magazine store still has a copy, in case you missed it. If not, you can order it directly from 73 Magazine, Peterborough NH 03458, for $1.

Here's a thought you might keep in mind for future reference on the complimentary transistors used in electromagnetic deflection circuits. In a bind, try 2N697s for the NPN and SK3020s for the PNP. If current requirements are exceptionally high

you can always parallel two of either type. As the scanning frequencies are low, we can pull quite a few short cuts like this.

Recently, Harry Mills K4HU, furnished us some very interesting information on the early scanning disc TV system I mentioned in last month's column. Harry, who during the late 20's was an engineer with RCA, told of receiving these pictures rather well. They were transmitted by WGY in Schenectady NY on the broadcast band. WGY would conclude radio programming at midnight and then transmit TV from about 12:30 – 1:00AM. An early "crater" tube, manufactured by Daven Co., coupled with a metal scanning disc approximately 41cm (16") in diameter gave 5.08cm (2") pictures. Fantastic! The only complaints I've heard is by the time you had adjusted the disc speed to sync, there was little time left to view pictures. I'm sure you can compare this to those first SSTV QSOs, which seemed so short, and you kept staring at the monitor afterwards, watching those pictures slowly decay. Incidentally, I am presently completing construction of a scanning disc transmitter, monitor and receiver, and applying for special permission to transmit these pictures on 80 and 20m. (1975 is the 50th Centennial of TV.) If all succeeds, I will have a full story, along with a very simple and inexpensive converter, plus a cutout for the actual disc to use here in 73. If it sounds like fun, drop me a card now. I need all the support possible for assured success. **K4TWJ**

By: Gus M. Browning, W4BPD
Drawer "DX"
Cordova, SC 29039

Looks like all the big conventions for this year are about through with. I did get to go to two of them, one in Jacksonville, Florida and the other over in Atlanta, Georgia. Both were well attended and looked very successful. I noticed that Transistors, ICs, printed circuit boards and all the new small size communication tools are getting more plentiful all the time. The big heavy stuff is not there like it used to be. If you are not "in there" starting to get your feet wet with these new "tools" of ham radio, you had better soon start or you will be left by the wayside. As for myself, I had been fooling around mostly with IC dividers, and the various gates, etc. Finally, last week, I bought three of these little Phase Lock Loops to fool with. I only wish I had more time to devote to this side of ham radio.

I hope all of you worked the boys on Kingmans Reef, due to a number of difficulties they did not get to stay there as long as they had planned, and they didn't get on the low-bands. I suppose this still leaves this Brand New DXCC on the "most wanted rare country" list for many fellows and it would not surprise me if someone goes back there again within the next year or so. We all hope they can stay long enough to remove the reef from the "rare" list for a while. But, keep in mind that even a country with one fairly active ham stays on the rare list for a lot more people than one with a 24 hour, round the clock operation that lasts for three or four days by a DXpedition. DXpeditions usually send out QSL cards pronto for all their contacts or at least to the fellows who send them a card. This is not true 100% of the time with fellows who have a whole country to themselves.

I have been reading about the upcoming frequency allocation meeting and the possibility we could end up with a couple new bands, perhaps get a few more kilocycles on some of the bands we now have and that we may lose a little on a UHF band. Except for that last item, the whole thing sounds pretty good and I hope we will have a lot more "gains" than "losses" when the meeting is through. That will be the time for that "log periodic" antenna that covers a whole flock of frequencies. I don't know of any antenna that can do that, unless it's a sort of multiple, long wire deal, one with many lobes in many different directions. Maybe some smart fellow will come up with a brand new antenna type. Anyhow, let's QRX and see what the outcome of the frequency allocation conference is and let's all hope for the best.

They say the sunspots are still getting lower and lower in number, and no one seems to really know when they will hit the bottom. The fellows are still working plenty of good DX; I guess they must work it fast when openings are short, or else there are more openings than the sunspots would indicate there should be.

Something that would interest every DXer would be a serious study of some of the very excellent DX QTHs of some of the DXers who so consistantly put out signals that are so much louder than other stations in the same general area. I have in mind such stations as W3CRA, W9ADN, exW4FU (the old original QTH), and a few others. These fellows put a consistantly louder signal into the far corners of the world than the average first class station. I so well remember that S7 signal from W3CRA over in the Indian Ocean and up in the AC spots when no other USA station was even being heard. I know most of them personally, they don't run any "big stuff" at all nor do any of them have up any super antennas. Something in the "lay of the land" or something under the ground does the trick. It would be very interesting to really know what causes those loud signals when the band is very poor for other DXers. It definitely is not high power, IT IS THE QTH and nothing else that does the trick.

I have had here as a visitor Jake Ritzen CT2AZ, WØJHY for the past couple of months. Jake came in here like a ball of fire and he is still a ball of fire! He has taken upon himself filing things where they belong, answering all inquiries the day they are received, filling the Coke machine, sweeping the floors, running up town, delivering and picking up, cleaning out the car, cleaning up the yard, keeping the grandchildren from the print shop and going out to a farm to pick various vegetables from the farmer (at very good prices). He just keeps on going all the time and so far has not slowed down at all. By the time this is in print he probably will be working up at a calculator manufacturing plant in Lexington, South Carolina. I am sure Peggy and I will miss him and all the FB work he has been doing around this establishment. Jake is one of these fellows who can't set still and twiddle his thumbs!

There is talk about fellows going to Aden, Iraq, Clipperton and other rare spots. I would suggest that if any of you need these three, that you keep your ears glued to the bands or subscribe to the 73 Magazine, "Hotline" or my DXers Magazine. AP2KS is trying for Burma, too. Let's all hope every one of them is successful in their plans and wishes. Seems like the bands more or less open automatically when a real active DXpedition is in the rare country. I guess there are a lot more openings than the sunspot count would indicate. Of course, the serious DXer will stick in there with a S-1 or S-2 signal and work the fellows.

Some of the DX that has been worked in the past few months: A51PN (Bhutan), FO8DY (French Polynesia, FR7ZL/T-Tromelin (hope they get his card), FK8BB-New Caledonia, JT1AT-Mongolia, KP6KR, Kingman Reef, KP6AL-Palmyra Island, KP6PA-same spot, TL8ET-Central African Republic, TN8BK-Congo Republic, 3D2FC-Fiji Islands,

9X5PT-Rwanda, A35FX-Tonga Island, BV2A-Formosa, CN8BO-Morocco, C-21DX-Nauru Island, HKØBKX-San Andres, S-2-Bengladesh (SM2DWH/S2), VK9NI-Norfolk Island, K9KGA/6W8-Senegal Rep., HR6SWA-Swan Island, KA6WT-Ryukyu Islands, TA2BK-Turkey, TA2SC-Turkey, VU2GDG-India, VE6JL/SU-Egypt, 9N1CK-Nepal, 9M2GV-West Malaysia and quite a few other DX stations. All these are so called "poor" conditions. Should be interesting to see what DX will be worked when conditions are again "good!"

DX QSL Info:

HR6SWA QSLs to H.W.S., Swan Island, P.O. Box 120, Grand Cayman, B.W.I.

KA6WT-(his home call is W4TAL) QSLs after September to his home call QTH.

VU2GDG via Box 1480, Coimbatore, India.

ZF1AL to WA4SVH.

9M2GV via K6LAD

VK9YU-VK6SW (I am not 100% sure of this, but I think it's o.k.)

A35FX via ZL2AFZ

VE6JL/SU-Via the VE6 bureau.

A51PN via W1JFL

FO8DY via Box 85, Papeete, French Polynesia

FK8BB via DJ9ZB.

JT1AT via P.O. Box 639, Ulan Bator, Mongolia

KP6KR via W6WX or NCDXF-P.O. Box 717, Oakland CA 94604

3D2FC-Via Box 1250, Suva, Fiji Islands.

DX DUE TO COME UP (at time of this writing)

VP8 (LU?) A group of hams from the Radio Club of Argentine is planning a DXpedition to SOUTH SANDWICH Islands. Plus a group from the West Coast (not sure of which West Coast DX Club they refer to), probably NCDXF group. Their plans are to be on South Sandwich either in November 1974 or January 1975. This will be a 4 day operation with all bands and modes being used; even will try to work the fellows in the Novice portions of the bands. They say that no certain group of fellows will be "favored," meaning I suppose that they will get stations all over the bands. 14275 up, etc. You had better make your plans to get this one, fellows, because it will cost plenty of money and probably will not be repeated again very soon. Getting to countries below the Ice Pack is big trouble, big boats and big money! I so well remember my trip to Bouvet Island.

SV1GA/A Mt. Athos – should have been on and finished by the date you read this. The trip is planned by those old faithfuls OH2BH, OH2MM and SV1GA. I would suppose the cards should go to Martin-OH2BH.

C21DX by JA1OCA, HBØ Late July, early August by DA1QC, HC2YL is Darlene fellows, HC2TV plans for some low frequency operation in October, will be trying for 5BDXCC while there and even some 160 meter operation.

Pacific DX net meets regularly at 0600z on 14265. If you are not a net member please wait until they call for non-members to check in. They generally have a few good ones checking in, and you might be lucky and get the one you need.

VK9YU, Cocoa Keeling plans to be active up until about October 1st (more or less).

During the QRP tests from the Pacific with W6WX using only 1 to 2 watts a good, usable signal was being heard in W4-land on 14100 kc 0400 to 0600 GMT. This was W6WX/MM in July while on the Kingman Reef trip with the other fellows.

VK2BKE/LH is now active and plans to be there for ONE YEAR. Was worked on 14265 kHz around 0600z.

BV2A has been working them on CW and by now should be on SSB. This is Frank, W9ZNY. When you hear HR6SWA you are hearing exKS4 land (Swan Island). They now only count for HR land now (except WTW still counts them as Swan Island). It has been suggested to me, by quite a number of DXers, that a rare DX station who is stuck with a transceive situation should go the "MC" route. It seems that when strictly transceive is used the situation slowly gets out of hand, then no one can hear the DX station because someone is ALWAYS CALLING. I listened to quite a mess when VE6JL/SU was on transceive and the fellows started the "chain-calling," when one stopped another started and this went on for quite a while. When they all finally came up for "air" the station in Egypt had just QUIT (and I don't blame him either!). It's a shame about things like this. Even the district by district of working the boys did not work out because too many fellows called out of order. W9DH tells me that the control was all shot by the time he got to W9. I guess the MC route is better under these conditions.

LETTER TO EDITOR R.E. DXCC, et al

Dear Gus

There seems to be a lot of controversy lately on what constitutes a "country," so here's my suggestion on how to please (almost) everyone. Although I'm not particularly a "certificate chaser" let's also realize that the more awards available, the more DX activity we stir up (WAS for example). Therefore, why not have an award for all DXers, regardless of their difinition of "country."

AWARD NUMBER ONE: for the purist – this award would be for working "political countries." KH6 would be USA, Latvia would be USSR, Ceylon would be Ceylon, Mt. Athos would be Greece, etc. The U.N. or I.T. UIARU would be naturals for sponsors.

AWARD NUMBER TWO: For the Political Scientist – include Colonies and Dependencies as separate countries, but exclude the islands reefs, or anything which can't be classified as a political or a colony thereof. This admittedly is a weak definition (ambiguous) but someone should be able to put it on paper properly.

AWARD NUMBER THREE: For the guy who resists change – Present DXCC country list.

AWARD NUMBER FOUR: For the DX Hound/Geographer. Include all countries, colonies, islands, reefs, dissenting autoomies, etc. All Canadian, USSR, Papanese, etc., provinces, the fifty states, and anything which can be found to have any basis for separate listing should be included even separate the 5 Hawaiian Islands.

This way, you could pick the award that matched your definition of "country" and the award chasers would have 3 new ones to work for. And it certainly would not decrease DX activity or demand for W/K types.

...WAØTAS

What do you think of this, fellows? Looks like Award number four fits our soon to come out Super WTW. None exactly fits our present WTW though – since we call our 'countries' all that's listed on DXCC, REF, DARC, WAP, etc., lists. In fact I still say, there must be a better word to use than "country" in our DX language. How about some of you fellows who know of a better word making a few suggestions to me?

When someone asks you how many countries you have worked and you say 300, they usually ask, "Are there 300 countries in the world?" About that time you try to change the subject to something else because you just cannot explain to anyone that Geyser Reef, Blenheim Reef or Kingman Reef and other similar places are "countries." Seems to me if such places are being called countries that ALL ISLANDS should be called the same thing. There I have said my 2¢ worth again, not that anyone is going to pay me the least attention!

The hook is clean here for this month fellows. How about some of you out there sending me a lot of

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good DX info for this page? I am sure a little publicity would not hurt anyone. We will of course mention your call as the source of the DX info you send to me. 73 till next month.

73 es DX,

de, Jim BPD

GOING FIRST CLASS !

Using the EBC-144 Jr. 2m Transceiver

Synthesis, with no limitations, is the name of the game with the new Emergency Beacon transceiver. For the first time we were able to dial up even the most oddball of repeaters.

The ads for the Emergency Beacon "Dream Machine" transceiver — a rig which could obviously do everything, including scanning, total synthesis, tone burst, continuous tone, Touch-tone, 600 kHz splits, 990 kHz splits, one meg splits, simplex — and you name it — the ads for this rig got a lot of fellows all excited, nervously putting away money now and then in case they talked themselves into getting one.

Unfortunately, as with most pieces of really sophisticated equipment, the delivery on some of the special parts required to put the rig into production stretched on maddeningly and the boys at Emergency Beacon decided to proceed with their secondary project, a junior model of the Dream. This is the EBC-144 Jr and it has all of the basic functions of the big rig such as synthesis down to 5 kHz steps, a priority channel scanning system, 600 kHz high or low split automatically for repeater operation, provision for connecting a scanner, and things like that.

The fellows at EBC were not only having problems getting the zillions of parts needed for the big unit, but they also found that while bread and milk had inched up only 25 to 50%, the prices on parts had in many cases doubled and tripled! This brought the price of the big rig from about $1000 to $1500, with many signs that even this stiff price might have to be increased substantially. The customers who placed their orders at the early price had indeed gotten in on a very good thing.

The Junior has been priced at $599 for starters. We'll be greatly surprised if this doesn't go up before long. And considering what the rig does, even at $600 this has got to be one of the best bargains in ham gear on the market today.

One of the first moves we made with the Junior was to mount it in the 73-mobile and head for the top of the local mountain to see how it would do up there in the high density rf that prevails. We checked it out on every repeater we could reach — and we can reach a bunch from up there. All we had to do was set up the "A" channel on the repeater output and switch to "Auto" on the mode switch and we were right in there.

While not too many rigs can weather the rf storm on top of the mountain without intermod and other garbage, the Junior was absolutely quiet. Even the several local commercial repeaters didn't break through! And they put out a lot of microvolts. Next we started checking out the splinter repeaters to see how the Junior could handle the 15 kHz spacing — particularly when the repeater was right in the next channel to a strong and oft used repeater. For instance we checked into WR1ACL in Salem NH which is set up on 147.165, right between WR1ABB in Framingham (Mass) on 147.15 and WR1ADF in Bridgewater (Mass) on 147.18, both of which are pretty active. Oh, we could hear some crosstalk, but it wasn't enough to hurt anything. It proved that it is possible to build a receiver which can handle the 15 kHz splits. Both ADF and ABB pinned the meter, which ACL was only about half way up at S-6.

Next we dialed up WR1ADC in Somerset (Mass), a 990 kHz repeater with input on 146.43 and output on 147.42. No strain with the Junior — just set the mode on "Split" and put the receive channel on "A" and the transmit channel on "B" dials, and kerchunk, there was ADC, loud and clear.

Aha, what about that private closed repeater in Manchester NH, the one with the secret input channel? We knew their input had been around 145.88 or so in the past and the output on 147.33 so we set up the rig to listen on 147.33 and, sure enough, there was the repeater with someone talking away. We quickly dialed up 145.88 and moved up and down, centering on 145.89, listening to the repeater input. Next we set up "A" on 145.89 and "B" on 147.33 in the Split mode and broke in with a short "Hello." It worked! "Who was that who broke in and said hello?" We gave our call and they promptly turned off the repeater. They do that to anyone who calls in who is not a member of their small closed group. There may be more unfriendly repeaters in the country, but word has not reached us about them. This is most distressing to the rest of the New Hampshire amateurs, who are rather proud of the warm and friendly reception they give visitors on the other New Hampshire machines — and there are a bunch of them.

Just to bolster our confidence in 2m FM and be reassured that the reception on WA1KFV was highly unusual, we checked into WR1ABQ on 25-85 in Derry NH, WR1ABU in Concord NH, WR1ACQ in Deerfield NH, WR1ACN in Londonderry NH, WR1ABF in Salem NH, and WR1ADX in Wolfeboro NH. All were outstandingly nice.

The reports on the rig were most complimentary — not only was it right on channel, but the audio was superb.

True to the "Never Say Die" motto which is more than a catchword at 73, we set up the rig to work on channel "A" and listen in with priority on channel "B" on 147.33 so we could hear KFV when they turned it back on again. After a while someone did tone it on and we knew it immediately for the Junior works fine on

channel A, but every few seconds it flips briefly to B to see what is doing there and then back to A again. That little function keeps you from missing anything. Fortunately cooler heads prevailed and nothing was done to further invade the privacy of the KFV group, despite some of the inflammatory remarks that were being passed.

In most cases where a repeater suffers jamming and heavy kerchunking, you'll find that there are some good reasons why this repeater has been singled out for harrassment. The KFV group is certainly asking for it, but since few ops have synthesizers as yet – particularly synthesizers which will cover the entire band and go down below 146.0, they've been relatively free of troubles. The Junior covers from 143.5 to 148.5, thus making it simple to get into all of these weirdo repeaters as well as MARS and even CAP repeaters which are just outside of the 2m band.

In the Automatic mode the rig transmits 600 kHz lower than the received channel within the 146 MHz segment and transmits 600 kHz higher in the 147 MHz segment, per the standard used just about everywhere in the country now. Some of the repeaters on 147.00 MHz have their input on 146.40, so you have to turn the mode switch to reverse for this. There are a few repeaters in the 147 segment which have input low and this will solve that problem too. Band openings and inversions drive these non-standard repeaters batty as they lock up on other repeaters sharing their channels, but with reversed input/outputs.

The Junior has a big plus in the back which mates with the EBC scanner and turns your receiver into a six channel scanning receiver. More about that extra option when we have a chance to check it out at length.

The transmitter is rated at 20 watts output, but the Bird Wattmeter indicated close to 25 watts on our unit. You don't really need an amplifier much when you're starting out with that amount of power.

The Junior has a built in speaker, like most 2m rigs (but not all), plus a jack in the back for an external speaker (we prefer to use the external speaker in the car which is mounted where it can easily be heard).

While there is not a lot of activity in New England below 146 MHz, with the exception of Oscar and a couple of repeaters which still have inputs below 146 (WA1KFV and WR1ACY in Glastonbury CT 145.47-147.09), it is nice to be able to tune down and actually hear what is going on in the rest of the band. The Auto function on the mode switch cuts out below 146 and the rig is simplex in that part of the band automatically. You'll find that the AM boys, what few there are left of them, will generally be able to copy your FM signals if you feel like calling them. If the FCC ever does open up more of the 2m band to repeaters, as many ops are beginning to think they should, the Junior will be able to cover the new band for you right off.

The receiver sensitivity was everything we could ask – the size perfect – the flexibility fantastic. Two meter rigs have certainly come a long, long way in the last couple years! When you consider the savings on crystals, even the cost of the synthesized rigs is not out of line. The Standard 1400 rig that we used for a couple of years required 44 crystals – at $4 each that came to $176 in crystals alone! Even if you've been managing to get along with a 12-channel rig, that's $96 investment in crystals.

One has to face up to a simple philosophical question – are you going to be satisfied to stick with one or two repeaters or are you the type of person who wants to be able to use all repeaters – who wants to have a rig that can be taken anywhere and put you in touch with what is happening? A lot of 2m ops get on one repeater and never go anywhere else. Presumably they are happy, so there is a chance that you can get along with this limitation and don't need a synthesized rig. We feel you'll miss a lot this way.

AMSAT NEWS

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

Jan King W3GEY, A-O-B Project Manager installing A-O-B in Thermal Vacuum for testing.

AMSAT-OSCAR 7 is scheduled to be launched from Vandenburg Air Force Base in California on October 10, 1974, sometime between 1600-1700 GMT. W6AB will broadcast the countdown on twenty meters. AMSAT members will be on the air most of the day, two frequencies to monitor will be 14,280 kHz, and 3850 kHz.

AMATEUR SATELLITE MATCHING FUNDS

William Eitel WA7LRU/W6UF and Herbert Hoover, III W6APW, have generously offered to match, dollar-for-dollar up to a total of $25,000, donations to the ARRL Foundation earmarked for use in the amateur satellite program.

Funds are urgently needed to support the construction of AMSAT-OSCAR 8, which is estimated will cost on the order of $100,000.

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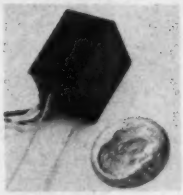

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News cont'd on page 131

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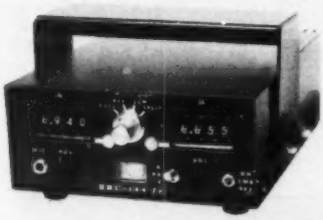

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The FCC as seen by ....

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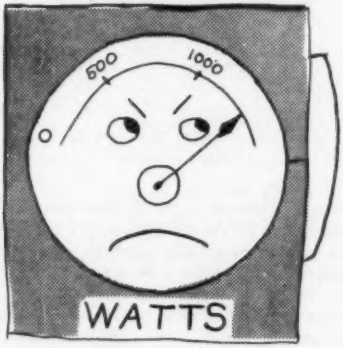


The California DX'er

The ARRL

The Novice

The Canadian Ham

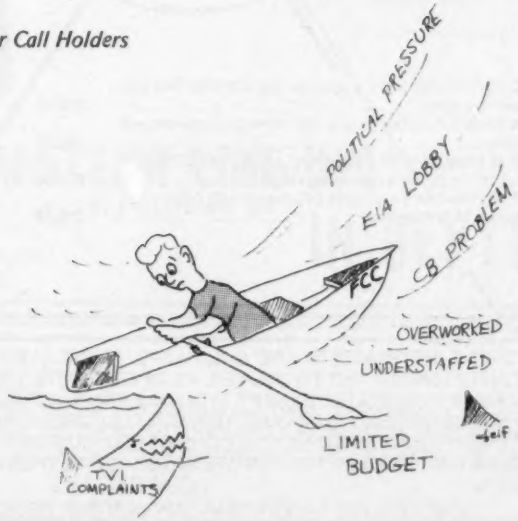
The FM'er

The New Two-Letter Call Holders

The CB'er

(The Chinese characters mean "Paper Tiger")

The FCC Itself



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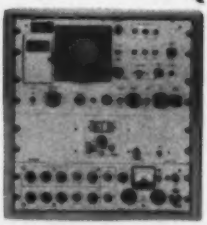

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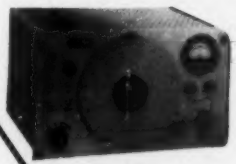

HP 233A
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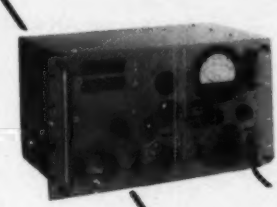

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Introduction to

"MICROTRANSISTORS"

Just how small can the homebrewer make an amateur rig – with reasonable-cost parts – that works well enough to get, say, 50 miles on 6 meters?

General Electric makes a line of microtransistors called "Microtabs," and in this line are some nice ones that will oscillate at frequencies as high as 1 GHz. And Bill Ashby of KMC Semiconductors makes some that go to 2 GHz.

Figure 1 shows a sketch of the approximate shape and size of these little molecular firecrackers. Now don't get the idea that just because they're tiny that you can't work out with them. Lots of things come to mind, such as 2 meter FM units suitable for repeater operation, and a host of other such devices.

As usual, with a reduction in size of an order of magnitude in one component, you have trouble getting the other parts down in size proportionately. We will deal with some of the components that are available today for the amateur homebrewer for making pocket-size rigs, and cover some circuits and modules that can be combined into such rigs.

As you will see even when you build a Dick Tracy rig that fits on your wrist, you'll still have to think about a microphone, speaker, and an antenna. Also, the average amateur does not have a good 10X stereo microscope on hand to work with. Nor does he have micromanipulators or any of the other devices commonly used for microminiature packaging applications, either.

Then there is the cost question. For the military or certain specialized commercial interests, where money is not the prime consideration, paper batteries, thin-film circuitry, etc., can be ordered to suit. However, there are certain things in this line that amateurs can do, and with a little prodding of suppliers of tiny components (reminding them, perhaps, of the large

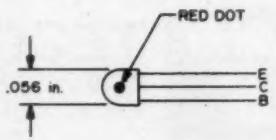
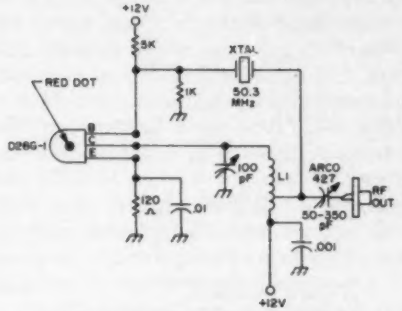


Fig. 1. General Electric D26G-I microtransistor



L1-25 TURNS 28 AWG TAPPED 4 TURNS FROM COLD END, WOUND ON 1/8 in. DIAMETER FORM, APPROXIMATELY 1/2 in. LG.

Fig. 2. Microtransistor crystal oscillator for 50 mHz. The first L1 is 9 turns, airwound, 1 in. long, 5/8 in. O.D., tapped at 2 turns from the cold end. The final L1 was 25 turns of No. 28 tapped 4 turns from the cold end and wound on a 1/8 in. form about ½ in. long.

percentage of amateurs in the ranks of technicians and engineers) can result in them shelling out with some very small capacitors, resistors, and inductors. Let's see what the amateur can do today with microcomponents:

Crystal-controlled Oscillator for 6 Meters

When you first connect one of the tiny little microtransistors as an oscillator, it's kind of startling to see the rf meters move and bulbs – which are several hundred times larger – begin to glow. And it's even more of a shock to find that amateurs miles away can hear you also! What kind of power are we talking about? A good solid 100 mW input for a starter. The GE job is rated at 90 mW dissipation "as is" – and don't forget, if you can light a bulb on the rf you can maintain a QSO over distances up to 50 miles!

A practical circuit of a 6 meter oscillator is shown in Fig. 2. At 12V the dissipation maximum of 90 mW is soon reached with 7 to 8 mA. But, at 40 to 50% efficiency you've got almost half of the dc input power going up to the antenna, so you can probably use 150 to 180 mW dc input once you get everything tuned up and have good output.

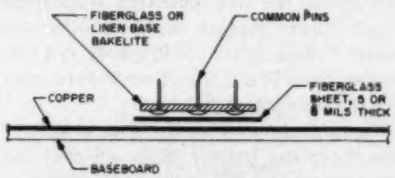
Details of component size, mounting methods, test layouts, and output checking circuits are found in the following paragraphs.

Size Reduction

This is not easy, if you're trying to match down to the size of the device. On the micrometer the D26G-2 shows 54 mils (thousandths of an inch) thickness and about the same for length, which comes to less than one cubic sixteenth of an inch in volume. You have to use tweezers even to think about mounting it. We do have resistors to match, almost. The 1/10th watt Allen-Bradleys are only some six times larger, and Sprague Electric in Nashua, N.H. makes some even smaller. Perhaps some readers know of some that match the device in size? 50th watt? 100th watt?

Capacitors are getting near to size also, with Mucons, made by the Republic Electronics Corp., Paterson, N.J., about 4 to 5 times bigger than the device. These are cylindrical in form and only 60 mils diameter, so they fit nicely in small places. You can see that we're still a little ways off from complete size matching, but it will do for a starter.

Next comes L1 and this is really a project. We'll go through a sample run to show you what's involved. There are micro-coils in existence, but I can't see advising homebrewers to use a lot of coils that cost $3 to $4 at this time. Let's see what we can wind up as quickies for pennies for ourselves out of a few inches of small wire and impregnated paper forms. You will see 75 mW rf output to let you in on an advance secret. If a satisfactory tuning core can be obtained to fit into a 1/8th or 1/16th inch form, and which will



1- CEMENT ASSEMBLY TO BASEBOARD USING COIL DOPE FOR PERMANENT USE.
2- USE HIGH-Q COIL WAX FOR TEST SET-UP.

Fig. 3. Side view of mounting terminals. Note: cement the assembly to the baseboard with coil dope for a permanent unit. Use a high-Q coil wax for a test setup.

tune without loss in the 50 to 150 MHz range, this will do away with the variable capacitor and bring us down to an overall thickness for the rig of under 1/10th of an inch. Right this minute this is just a sort of dream, but keep reading.

Test Mounting

My immediate thoughts on seeing the microtransistor with its 5 mil gold leads for the first time concerned the handling and mounting. You can get used to this soon enough, even though in my case, having arrived in this world in 1904, I now use fitted glasses with 2X power of magnification. The first thing is the question of subminiature "binding posts" (as they used to be called), and for new readers a brief description follows. Figure 3 shows a side view of one method of making these items that will only cost you a trip to the 5¢, 10¢, and $20 store. I use the 21 mil diameter "Bank Pins," and drill a 20 mil hole in a thin piece of fiberglass or linen-base Bakelite. When these pins are driven through these holes from the underside and then soldered on the top side they *don't* pull out. Figure 4 shows a top view of the three pins used with the microtransistors and various small capacitors, resistors, and inductors also attached, with approximate layout for testing.

You can see the items that need plenty of size reduction work, such as the crystal, the trimmers, and of course the inductance itself. The small one shown here in the final circuit however, sacrifices nothing in power compared to the "big" airwound coil used for tests. It puts out 30 to 40 mW.

A lot of the size reduction work mentioned means finding suppliers who can furnish subminiature components at a reasonable cost. This is sometimes a lot harder than the benchwork involved.

Figure 5 shows a handy filter to keep rf away from the battery leads where it can otherwise cause lots of trouble for you when more stages are used, such as amplifiers and/or multipliers. This trouble by the way is very hard to identify as it causes feedback paths with odd phase effects through the battery leads. You may be

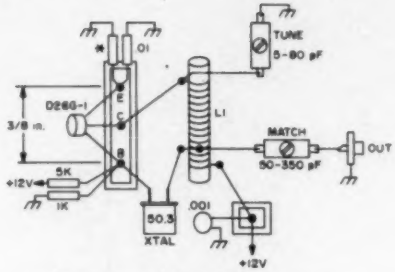


Fig. 4. Layout, top view, of circuit in Fig. 2.

using separate batteries for tests and everything is going fine, and then when you start connecting to a common battery everything goes suddenly haywire. Use the filter.

Certain things can be done to reduce size after this circuit and operation is firmed up. For instance, the main amount of capacitance in a large trimmer may be obtained by using a fixed capacitor with a small trimmer in parallel. The Arco 402 midget trimmer runs 1.5 to 20 pF and is only 9/16ths long by 3/8ths wide. This is still "huge" compared to the device, but it can be used.

The same thing can be done for the tuning capacitor across L1. The whole question of size for tuned circuits is wide open so far, as you can easily see.

Matching Outputs

Starting out on a try for power (don't laugh now, remember that guy who laughs last . . . and also the "mile-per-milliwatt" formula), it seems at first preposterous that a tiny speck of material shown in Fig. 1 could ever generate enough rf to actually light a bulb. Indeed, at the first try it only showed one volt at the test diode dc output (see Fig. 6).

Incidentally, the matching values shown were not arrived at immediately. R4 is very important because you can easily draw over ten mils with various tuning setups in the oscillator itself, as mentioned. When all the parameters such as feedback tap, emitter resistor, L1, C1, the crystal, the transistor itself, and the proper output match, are

all working together you can then push up the output power, with the internal dissipation going up to the maximum of 90 mW. Assuming an efficiency of 40 to 50%, that is, with everything matched and tuned up with some half of the dc input power going up to the antenna in rf form, you could run some 10 mils at 12 volts, or even a little more. Note however that if detuning or other mismatch should occur you may dump all of that input into dissipation, and goodbye to your little microtransistor.

Working with C1 and the feedback tap on L1, and always with R4, things started to pick up, with the output climbing toward 5V dc out of the test diode D1. At this point, which indicates some 15 to 20 mW of rf output, I started checking with a No. 48 bulb that glows a dull red on 18 mW. It didn't light yet, but finally with the match shown in Fig. 6 it did, and before long, that is, another hour or so, it was up to about 40 mW, still keeping the total dc input to 120 mW or less. Maybe one could immerse that tiny little blob in oil? We used to do just that back in the early 1920's, taking the metal base off the "powerful little five watters," which were the Radiotron 202 tubes, if I remember correctly back to that far-off circa of some 46 years ago, and put them upside down in a gallon can of transformer oil. Then run 100 watts. I may try this on the little blobs if GE or Bill A. sends me a couple dozen more devices. That kind of work is usually called "test to destruction."

So finally the output circuits of Fig. 6 were worked out, using the temporary C1 and L1 and we started reducing these components down to size.

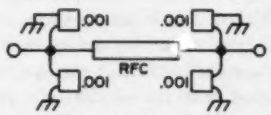
Small Size Tuning Inductors

There has been a lot of talk about the theory of using transistors and making them "act like inductors," but so far I don't see any on the market. So, while watching and waiting we'll get along with small coils. You may be surprised at what they can do. I was.

So here we go with spools of small wire up to No. 36 in size, and coil forms down to 1/10th of an inch in diameter.

Coil No. 1 was airwound, ten per inch, 9 turns, 5/8th O.D. which was used as a standard. No. 2 was 12 turns of No. 20 on 1/8th inch paper tubing. It worked fair to good, but required nearly 100 pF of tuning capacity. No. 3 coil was also on 1/8th inch O.D. tubing but with 25 turns of No. 28 dcc (double cotton covered), with tap at 4 turns. It worked as well as the first reference coil. This No. 3 coil is huge compared to the device, but there is a question of just how much time you can spend on microcoils. Coil No. 4 was 25 turns of No. 38, tap at 5 turns, two-thirds jumble wound. It oscillated well, but only had about one half power out. No. 5 was 25 turns of No. 34 dcc, tapped at 5 turns, 90% jumble wound, with output tap at 3 turns. Only fair output. Referring back to coil No. 1, it was found that the use of a tap instead of a separate link output winding gave more output. Coil No. 6 was 25 turns of No. 26, tapped at 4 turns for the emitter and 2 turns for the output. Output went up to 5.5V, holding the current at 6 mils. Tapping on the output at 4 turns along with the emitter brought the output up to 6V. This looks as though we are zeroing in on what is needed. This No. 6 coil is 5/8th of an inch long and the O.D. is about 3/16th of an inch, which may be the best compromise for now.

Checking to see how close to the copper-clad baseboard such a coil could be placed it was found that there is only a 1 or 2% reduction when the coil was practically touching the copper. To be exact, it was about 1/32 of an inch away. The tap at two turns was almost as good . . . not too critical. The feedback tap at 4 turns and output tap at two, worked well. C1 is around 20 pF and thus the small Arco



RFC – 10 TO 20 TURNS SMALL GAUGE ENAMELED WIRE WOUND OVER 1/10 WATT RESISTOR, 1K OR OVER.

Fig. 5. Dc battery filter; C = .001, 1/8 in. square. RFC = 10 to 20 turns of any small size wire on 1/10th watt resistor over 1K.

midget trimmer can be used, but a check was made anyway with reducing the number of turns on coil No. 6. With 15 turns the output was only 1.5V, so that was n.g. Coil No. 7 was 20 turns of No. 28, with tap at three turns. Only 2.5V output.

We are going to describe an rf amplifier and frequency multiplier using these little specks, but there are two good reasons for peaking up the power from the cyrstal oscillator. First, if it's a good oscillator it will be more stable and operate well on reduced battery power and with aging. Second, you may want to try it on the air. Modulating a crystal oscillator is perfectly legal, at around 80%, and if RCA can do it so can we.

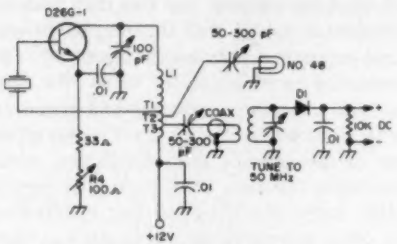
There is an interesting forumla which comes out at "a mile per milliwatt," but more on that later.

Different types of output coupling were also tried and while a pi-network furnished slightly greater output under certain conditions, link coupling and tapped on coupling light bulbs and furnishes good output power to 50Ω cables as well. With a little more care and testing, the best inductance which we have found so far involves a rather large value of trimmer, but is easy to wind and does light a bulb to around 40mW and produces well over 5V on the diode test. This is shown in the final circuit, Fig. 6, where the feedback tap is seen to be the output tap as well. It works fine, is a strong oscillator, and produces good drive into the rf amplifier shown later.

Rf Power Amplifier

As suggested before, don't laugh; that tiny bug is putting out 75 mW, amplifies, matches, tunes in fine shape, and has not self-oscillated yet. Figure 7 shows the final schematic with the layout as in Fig. 8. I started out with dc bias on the base but soon found that the oscillator's 20 to 30 mW of rf was enough to push the amplifier collector current to 20 mA, which is certainly more than the rated amount for continuous use. An rf choke was installed between base and ground, a usual method with amplifiers, and the input was set.

Tapping the collector down on L1



T1 - TAP AT 4 TURNS FROM COLD END OF L1.
T2- " " 2 " " " " " "
T3- " " 1 " " " " " "
USE ONLY T2 OUTPUT OR T3 OUTPUT, NOT BOTH.
L1-9 TURNS

Fig. 6. Power indicator and output matching. Use only one of the outputs at a time, either the pilot bulb or the diode power indicator.

resulted in better tuning and more output, so it was checked up and down L1 for the best output, which occurs when the collector tap is near the middle of L1.

There is an impressive dip in current at resonance, always a welcome sign in solid state amplifiers, and by varying C4 this dip, which is much smaller of course when the amplifier is loaded, and the maximum rf output, could be adjusted very precisely.

The emitter behaves according to Hoyle also with a smooth climb in mA and output power as R1 is decreased from 133Ω down to 33. Be careful there, because at 33Ω you may be getting too much current.

I'll have to get more information from GE on the question of maximum dc power in and rf out, because they rate this chip at 90 mW dissipation. With 14 mA input at 12V, for a dc input of 168 mW, it puts out at least 75 of rf, and 75 from 168 leave 93 mW, which is the present rated limit. These devices are not expensive however, so it is more a question of the trouble of opening the shielding enclosure and soldering in a new device. I have a drop of wax on the outside of the plastic case to see if it gets hot enough to melt, but that may not tell the proper story. Even if it was a metal case, there is a real tiny chip inside that can get hot and melt if the internal leads do not carry away the heat to the outside. This whole rig is supposed to eventually fit inside a cigarette-sized package, so perhaps we should be content with a good clean 75 mW. There is also the question of modula-

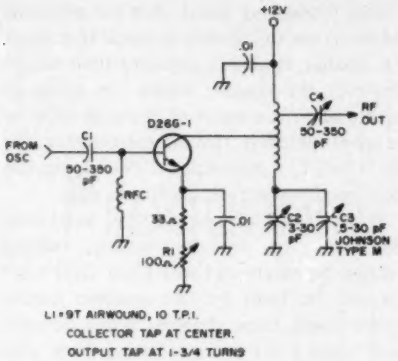


Fig. 7. Microtransistor rf power amplifier. L1 = 9 turns wirewound about 1 in. long, with the collector tapped in the center and the output tap at 1¾ turns.

tion with its double collector voltage for AM. For two meter relay work and FM it's practically ready to go.

Collector inductance tests were run on this unit and the 1/8th inch coil form showed up as at least 98% equal to the No. 1 coil. Apparently the loaded Q does not differ much from one coil to the other. In certain cases however, the loaded Q being higher might well be needed for selectivity, as in a heterodyne vfo, or in tripling.

A Frequency Multiplier

Inasmuch as the internal chip in the GE D26G-1 is a 2N918 type, which is a well-known UHF device, it should work well as a multiplier, and it did. With some change in the base bias, which needs to be increased for multiplier service, another collector coil for the higher frequencies, and changing the oscillator to 48 MHz, it took off like a bandit on 96 MHz as a doubler with some 50 mW output. After several hours of tuning and pruning for a tripler stage, 5V of dc was registering at the tuned diode meter on 144 mHz, which is in the neighborhood of 15 to 20 mW output. The circuit should be considered as temporary as this is just a "get-acquainted" one. It is essentially the same as shown in Figs. 7 and 8 with a change in L1, which is now 2 turns, airwound, 10 per inch, 5/8ths diameter, tapped at 3/4 of a turn for the output, and tuned by C3 only. C2 is left out. Be *sure* and check for 96 and 144 MHz with an absorption wavemeter as you double and triple.

Note that the collector does not like to be tapped down on L1 when working as a multiplier.

A 432 MHz crystal exciter will be an interesting project, especially with some of those 2 GHz experimental microtransistors Bill Ashby sent up. 1296 vest-pocket rig?

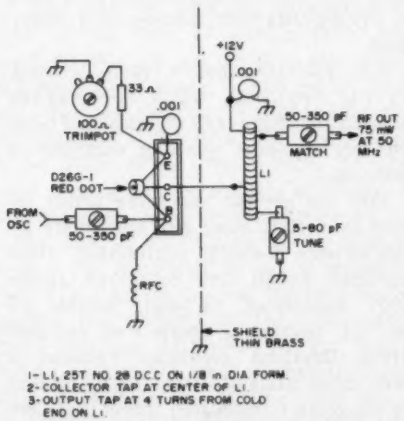


Fig. 8. Layout of rf amplifier. L1 = 25 turns No. 28 dcc on 1/8 in. form, collector tap at center and output tap at 4 turns from the cold end.

Trouble Dept.

Have a good laugh on me over this one! Switching coils around while testing on the rf amplifier and multiplier circuits, I went back to Six and the power output suddenly was very low. Everything tuned nicely, the oscillator peaked properly, etc., but there simply wasn't that good old 75 mW output. Only about 25 to 30. Worse still, the emitter resistor would *not* bring up the power, it *dropped* it! I checked the base input circuit, the collector tuning, no soap; then, not a bright flash but rather a kind of dull awakening seeped in. How many times I had warned readers to check the frequency of output circuits with an *absorption* meter. Quick like a bunny (a 65 year old one) I reached for the 50 to 150 MHz wavemeter and there it was, not 50 MHz in the collector circuit but 100 MHz! I had a good double but I wanted an amplifier at

that moment. Naturally the emitter pot did not bring up the power because a doubler needs more bias than a straight through amplifier. I had forgotten to solder back in the 3 to 30 pF trimmer additional capacity across L1 and was peaking on 100 MHz. Just for fun I looked back through the years to see when I first worked with a multiplier and found it was circa 1939–1940, doubling from Five to Two and a half meters, a little matter of thirty years ago. The QTH was Greenwich, Conn., and the call was W1LAS, in case anyone else is still around from those days.

So, keep those absorption meters on hand and use them.

One interesting point. Are the elements and leads on this device so small that there is a smaller feedback capacity than usual? Whatever the reason, which I'm going to inquire about on some of my next visits to the manufacturers, this microtransistor, the GE D26G-1, a miniature 2N918 type, has been free from self-oscillation to date.

It appears that pocket size, hand-held VHF sets for repeater testing, talking through repeaters and just plain QSO's for fun can be built by the amateur home-brewer using these devices. Some components need a lot more reducing diets, and some are nearly ready right now, as to size.

. . . K1CLL

MEET THE NANOFARAD

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Our old friend, the microfarad, has been with us for a long time. He was a handy unit when about the smallest capacitance we used was a "triple oh two five" grid condenser for a UV-201-A tube. We got somewhat disenchanted with our old friend when we started talking about "six oh point two" as the grid-plate capacitance of a vacuum. Then we trotted out a monstrosity, the micromicrofarad. This turned out to be just too much of a mouthful to utter in rapid conversation. The next step was to revive picofarad, which had a wave of popularity in the twenties but was quietly dropped when someone alleged that the prefix had a naughty connotation in a certain unidentified language. Picofarad worked quite well, but there remained a disconcerting gap between it and microfarad that could be filled only by using an awkward multidigit expression such as "fifteen thousand picofarad," which left half your listeners wondering just what part of the familiar microfarad you were talking about; or by using an equally awkward fraction of a microfarad.

But, patience, there's rescue at hand. It's the nanofarad, which falls midway between the micro- and the pico- and takes full care of those puzzling multiples or fractions.

You can get the nanofarad firmly infixed into your mind and vocabulary by remembering a simple relationship: 1000 picofarad equals one nanofarad equals 0.001 microfarad. So that "double oh two" μF becomes a simple 2 nF and that fifteen thousand picofarad becomes a much more straightforward 15 nF. Makes life much less complicated, doesn't it? Give it a whirl.

. . . W5JJ

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Frequency Synthesized HT-220

Part 1

The very popular HT-220 handi talkie has suffered many modifications at the hands of amateurs, but none so extreme or unusual as this one. With apologies to Motorola, I will describe for you my 400 channel, frequency-synthesized HT-220. This article will cover a general description of the theory of operation. Part II will give the actual circuitry used in the rig. This is not a construction article, as such, although the experienced builder should have no trouble duplicating the work.

The rig to be described was assembled with the knowledge that it would probably not work the first time and would require much in the way of modifications and twiddling. Most of the circuitry was assembled on plug-in circuit boards which were later modified. New circuit boards have not been designed at this time. The wise builder should place all of the circuitry on one board since all of the changes necessary to make the gadget work are presented here.

The idea for this transceiver was born as much out of frustration as out of necessity. When I first got on 2m FM, the local 34/76 machine was changed to 16/76 two days after I bought a 34 crystal. At that time I decided to find out what a synthesizer was and how to build one. At the same time I was discovering the world of integrated circuits. I decided to build the FS-220 (original, isn't it) using all TTL logic. Nine months later the FS-220 was born (time lapse also coincidental).

The rig was designed to be the ultimate in flexibility and to take advantage of the low-cost TTL logic now available. It was built around a surplus HT-220 circuit board, the "universal" type with a T/R relay rather than a PTT switch. The basic characteristics of the rig are:

Frequency coverage of 144-148 MHz.

400 independent receive and transmit channels with 10 kHz spacing.

Digital readout of all frequencies.

IC memory which stores the receive and transmit frequencies and is programmed from a Touch-Tone(R) pad.

TT pad operates normally when not used for programming.

Scanner which may be set to cover either 50 or 100 frequencies within a 1 MHz range (10 kHz steps).

Powered from 12-15 Vdc (2A receive, 2.4A transmit).

Modular construction for ease in modification and repair.

Construction cost less than $200 if surplus houses and junk boxes are well scoured.

Operation

Before getting into a block diagram of the rig, an example of its on-the-air operation should make clear what the above charac-

teristics provide. Let us consider working a repeater with non-standard frequencies so that no numbers are duplicated. To operate on 23/84, the front-panel MHz switches are set for 146 MHz operation as indicated on the readout (see front panel photograph). The CHAN REV switch should be in the NORM position, and the SIMPLEX and SCAN switches should be off. The OPERATE-PROGRAM switch is placed in the PROGRAM position and the repeater frequencies are punched into the pad, receive frequency first. . .8. . .4. . .2. . .3. For those who cannot reverse the frequencies comfortably, the numbers can be entered as 2. .3. .8. .4. .plus any two other characters, such as 0. .0. . or *. .*. . The OPERATE--PROGRAM switch should now be returned to the OPERATE mode. The digital display will indicate reception on 146.84 MHz. When the PTT switch is depressed, the display will change to 146.23 MHz and the transmitter will be keyed. For SIMPLEX mode, this switch can be placed in either the A or B position with the result that the rig will remain on either 146.84 or 146.23 MHz for both transmitting and receiving. To go "reverse-repeater," simply place the CHAN REV switch in the REV position. The display will change to 146.23 MHz and you can listen to the inputs to the repeater and transmit on 146.84 MHz.

For scanning, the SCAN switch is placed in either A for 100 steps, or B for 50 steps. In position A, the receiver will scan from 146.00 to 146.99 MHz in 10 kHz steps and the display will follow it. If a signal is encountered, the scan will stop and the display tells you what frequency you are listening on. Two or three seconds after the carrier goes away the scan will pick up again. With the SCAN switch in the B mode, the receiver scans from 146.50 to 146.99 MHz in 10 kHz steps. My scanner takes slightly less than 5 seconds to scan the upper half of the megahertz and is convenient for listening only for repeater outputs. When the scanner is turned off, the rig returns to the frequency pair programmed into memory, in this sample case, 23/84.

Any 1 MHz range can be covered by setting the MHz switches on the front panel. This does allow you to receive on 146.50, for example, while transmitting on 144.10, or some other weird combination (like 146.40/147.00 MHz).

Block Diagram

Fig. 1 is a block diagram of the complete transceiver. The actual frequency synthesizer

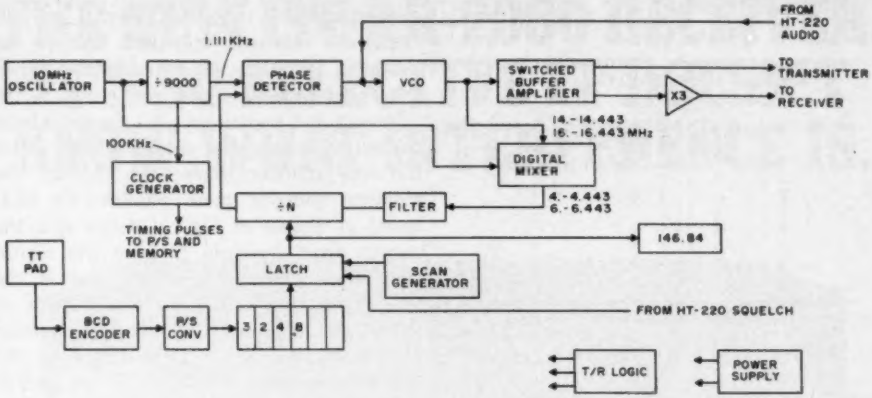

Fig. 1. Block diagram.

portion of the rig is almost conventional, but does have one feature not ordinarily found in amateur gear, a digital mixer. The main frequency determining element is a voltage-controlled oscillator (VCO) consisting of a single IC. Its frequency is controlled by a dc voltage derived from a phase detector. The range of frequencies it can cover is switched by changing the LC constants. On receive, the VCO covers 14.000 – 14.443 MHz and 16.000 – 16.443 MHz on transmit. Its output is tripled and fed to the HT-220 receiver for LO injection and also goes directly to the transmitter where it is multiplied by nine. The VCO is locked on frequency by the phase detector which uses a 1.111 kHz signal as its reference (these derived from a 10 MHz crystal controlled oscillator. The 10 MHz signal is divided by 9000 in a fixed divider chain. To provide the second input to the phase detector, the VCO output is first mixed with the 10 MHz from the crystal oscillator to give 4.000 – 4.443 MHz on receive and 6.000 – 6.443 MHz on transmit. The mixer used is a digital mixer (an "exclusive OR" gate). Its output contains just about every combination of the two input frequencies, so filters are used to select the desired range. The filter outputs are divided down to the 1.111 kHz range in a programmable divider. During receive, the ÷N programmable divider is programmed to divide by 3600 – 3999. For example, to listen on 144.00 MHz, the LO injection must be 126.00 MHz (18 MHz 1st i-f). That requires a VCO output of 14.000 MHz (14.000 x 9 = 126.00). The output of the digital mixer is then 4.000 MHz. When this signal is divided by 3600 the result is 1.111 kHz. By the same reasoning, 4.443 MHz also gives 1.111 kHz when divided by 3999. For transmitting, the programmable divider (÷N) is set to divide by 5400 – 5799. Since the 1st i-f in my HT-220 is on an even megahertz (18.000 MHz), the last two numbers in the number N always equal the hundreds and tens of kilohertz at 2m. During transmit, the third number in N always equals the megahertz. This is a convenience, but not a necessity. *This scheme can be easily used with i-f frequencies such as 10.7 MHz with only slight changes in the ÷N programming* (see K2OAW's article, October, 72).

Most synthesizers use a formidable array of switches to program the ÷N counters. I wanted to have a digital display and a TT pad on the front panel. The thought of also including an array of switches didn't appeal to me (I really wanted to play more with IC's). To get away from the problem, I devised the scheme for using the switches on the pad to do the programming. The hams around Dayton feel that the circuit is the product of a deranged mind, but it does work and is really quite a convenience. It also is good for several minutes of chatter on the repeater most any time.

The switches on the TT pad (not the

DECIMAL NUMBER	BINARY–CODED DECIMAL EQUIVALENT			
	(8)	(4)	(2)	(1)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

The decimal number is the sum of the rows containing a "1". Example: 7 equals 0 + 4 + 2 + 1. The decimal number 82 would be 1000 0010.

tones) are used to enter the desired frequencies into the IC memory (hundreds and tens of kilohertz). First, the output of the pad is encoded in binary-decimal format (BCD). The output of the encoder consists of four lines. The signals on these lines represent the decimal number punched on the pad. A logical "0" is equal to 0V and a logical "1" is equal to about 3.5V. Using these zeroes and ones, the decimal number 2 would come out as 0010, as shown in Table I. The BCD equivalent of the decimal number goes to a parallel-to-serial converter where the four lines are changed to only one. Instead of four signals on four lines, the output of the P/S converter is on one line, with the four signals being transmitted down the line one at a time. For the decimal number 2, the output of the P/S converter would be 0...1...0...0...whenever the 2 button was pushed. The timing pulses required to do the conversion are derived from the clock generator. A 100 kHz square wave is taken from the fixed ÷9000 chain and used to generate the required pulses. As a result, the four signals making up any one decimal number are sent down the line from the P/S converter at the rate of one signal every 10 microseconds. At the other end of this line is the memory. It is a left/right shift register with parallel input/output capability. Mine has a capacity for six decimal numbers (24 bits, each signal in a BCD number being a "bit"). The bits enter the memory from the left. With the example used earlier for 23/84 operation, let us assume that the numbers are punched in as 8..4..2..3.. When the 8 is punched, it is converted into a serial BCD format and gets "shifted" into the left-most slot in the memory. This takes 40 microseconds. When the 4 is punched, it also gets stored in the left-most slot in memory, but the 8 has been shifted to the right at the same time. After the four numbers have been entered, the memory contains these numbers (in BCD form) as shown in Fig. 1. Notice that the output from memory is from the center eight bits (center two slots) and is the receive frequency. For the other mode of entry (six punches), the receive frequency is also in the center two slots, but the transmit frequency will be in the two slots at the right side of the memory. To get the transmit frequency all the way over to the right requires those two extra "inputs."

The output from the memory goes to a 4-line data selector which acts as an electronic 4 PDT switch. It selects either the output from memory or the output from the scan generating section. The output of the data selector enters a temporary storage area consisting of latch ICs. The latches do several things. First, they hold the current frequency while the memory is being programmed. This allows you to listen to one channel while punching in another. When in the scan mode, the latch is the element that stops the scan when a squelch signal appears from the HT-220 receiver. The digital display is fed from the output of the latch (at least the hundreds and tens of kilohertz).

The output of the latch elements supply the hundreds and tens of kilohertz necessary to program the ÷N counters (for example, the 84 in 3884 for reception on 146.84). The 3 is programmed by the T/R logic (3884) and the 8 is set by the front-panel CHANNEL B MHZ switch (3884). During transmit, the only difference is that the T/R logic sets the first number to 5 (5623) and the CHANNEL A MHZ switch sets the 6 (5623).

If you have been following this nightmare closely you are probably wondering how the proper megahertz gets displayed during receive. Look back at the examples and you will see that for any given receive frequency, the ÷N counters must be set to divide by a number that is higher by 2 than the received megahertz (to receive 146 MHz the ÷N must

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This plus: modular construction; digital frequency readout; all bands (160m-10m) in 1 MHz ranges; two independent channels for dual receive, transceive-plus-receive or split-frequency operation; adjustable IF Passband (to within 100 Hz); 16-pole filter for over 200 dB skirt selectivity (standard 2.1 kHz BW, shape-factor 1.4:1); adjustable-Q/adjustable-frequency Notch and Peak Filters; adjustable-threshold noise-blanker; Receiver-Incremental-Tuning; and many other features found in no other receiver. Introductory price: $1,250 with **two-year** warranty.*

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*Warranted to be free from defects in materials and workmanship. Factory or authorized dealer repairs at no cost to owner for two years from date of purchase.

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be set to 3800). To get the proper display, a simple circuit is used which subtracts 2 from the ÷N number before going to the readouts. The 14 portion of the digital display (144.57 MHz) never changes, so it is permanently wired on. This also eliminates the need for two seven-segment driver ICs. This scheme for subtracting (or adding) will be described next month. It can be used with any synthesizer to give a digital display without thumb-wheel switches. It must be taylored for the particular range of ÷N numbers in use.

The clock generator provides the necessary pulses for the memory to store the input frequencies. It also causes the memory to shift between transmit and receive. As described earlier, when programming is done, the desired receive frequency is being output from memory. When the PTT switch is closed on the microphone the T/R logic commands the memory to shift right and the clock generator sends the memory 8 pulses (CHAN REV switch in the NORM position). These 8 pulses are sufficient to move the receive frequency to the right side of the memory and to move the transmit frequency into the center two slots. When the PTT switch is released, the T/R logic commands a shift-left, and 8 pulses from the clock generator restores the synthesizer to the receive frequency. Everything is just the opposite, of course, if you use the alternate mode for programming (CHAN REV switch to REV and enter transmit frequency first). The time required to shift the memory is only 80 microseconds. This is negligible compared to the 50-100 milliseconds required for the phase-locked loop to stabilize on the new frequency.

In the scanning mode the data selector picks the hundreds and tens of kilohertz numbers from the scan circuitry, rather than from memory. The scan circuitry is simply two IC counters, a 7490 and a 74192, set up to divide by either 50 or 100. A simple free-running oscillator feeds this counter with a 10 pps square wave. The output from the ICs is taken from the "Q" output of each flip-flop, giving the BCD equivalent of all integers from 00 to 99. The 74192 can be programmed to reset to 5 rather than 0, restricting the output numbers to 50-99.

When a carrier is encountered, a squelch signal from the HT-220 freezes the frequency in the latches. This prevents the PLL from changing. The scanner goes on generating new frequencies, however. I used this scheme because I couldn't get my oscillator to start and stop quickly enough to suit me.

Miscellaneous

The power requirements of the TTL packages are taken care of by single package voltage regulators (LM-309) mounted on the rear of the chassis. The T/R logic has provisions for keying an external relay if needed. The audio for creating FM is taken from the HT-220 board and fed directly to the dc control line of the VCO. The output of the TT pad is connected to the microphone input in standard fashion.

Next month I will describe the circuitry used to accomplish all the good things just presented. Many of the individual circuits will find applications in other amateur projects.

. . . . **W8KBC**

Saving Tubes In The Galaxy 5

After seeing how hot those TV-type tubes in the final of my Galaxy V Mk 2 were running – and having one go out soon after installation, I decided to install a small fan above that section of the rig where these tubes are. The fan is a small open motor unit with a 4 in. blade, which sells for about $2.50 at several of the radio houses. Mine is mounted on aluminum brackets on a pegboard and is about 2 in. above the top of the transceiver. Any of several methods may be used for mounting, depending on existing surroundings.

The motor is wired so that the fan turns on automatically with the unit so that it goes continuously. Since installing the fan about a year and a half ago, the tubes have not needed replacement and show no signs of weakening.

. . . **Sam Jamieson W9GQQ**

Frank Jerome WSOJZ
908 Holoway
Midwest City OK 73110

repeater GOVERNMENT...

An organization needs some rules with which to govern itself to accomplish all the things that it takes to keep a good repeater on the air. These rules are usually called the Constitution and the bylaws. Unfortunately, a lot of the bylaws never seem to get written, or officially adopted, and seem to die their own natural death.

The Constitution and bylaws are very important to persons other than the immediate club members. You need to provide copies of the Constitution and bylaws to at least three governmental agencies. These are the Federal Communications Commission for the repeater groups club station license, The Secretary of State for your incorporation charter, and to the Internal Revenue Service for your Code 501-C Non-Profit Organization Corporate Income Tax Exemption.

In addition to your clubs 200 or so members, the three governmental agencies bog down changes to your clubs Constitution and bylaws. Reproduction alone, or plain ink on paper is a monumental task, not to mention redistribution of the changes to everyone that is suppose to have the copies and changes. Sure would be nice if one complete and thorough Constitution and bylaws could be made, adopted and submitted to the membership and agencies, and never have to be changed again.

The following Constitution and bylaws are such an attempt, that is, to try to be as complete and all encompassing as is possible, so that there will be no big changes looming on the horizon within 30 days after you have reproduced and sent all that paper to all concerned. Here is how it goes:

ARTICLE I – NAME

The name of this organization shall be ROTTEN RADIO REPEATERS, INC. (Obviously, a fictitious name used here for explanatory purposes. Since the constitution and bylaws need to go to at least three governmental agencies, it would be well to select a name that is catchy, meaningful, somewhat sophisticated. See "Repeater Economics" in April, 1973, issue of 73 Magazine.), a non-profit organization hereinafter referred to as the Club.

ARTICLE II – OBJECTIVES

The objectives for which this Club is organized are:

1. To render a public service to governmental agencies during impending storms or severe weather, as well as to assist in disaster relief operation and other community functions as required.

2. To unite the amateur radio operators of this area for the purpose of exerting effectively a combined influence upon matters concerning amateur radio operation.

3. To promote good operating procedures and the exchange of technical information and assistance.

4. To stimulate adherence to a code of ethics, both written and understood.

5. To admonish members to comply with existing FCC rules and regulations.

6. To be an influence to new amateur operators of the area in the operation of their station.

7. To promote good will and fellowship among the members.

8. To further the art of electronics and encourage prospective members to participate in the purposes of the club.

ARTICLE III – MEMBERSHIP

SECTION 1. Eligibility for membership in the club is set forth as follows:
Any person is eligible for FULL MEMBERSHIP provided that:

a. He holds a valid Amateur Radio Operator/Station license.

b. He indicates a desire to become a member.

Any person who was included in the original organization of this club will be considered as a CHARTER MEMBER.

SECTION 2. To become a member of the club, a person who is eligible must furnish his name, address, call sign, telephone number, and annual dues to the Secretary-Treasurer.

SECTION 3. Honorary Membership may be bestowed on any eligible person by a majority vote of the members present at any regular or special meeting. Honorary memberships will not be for more than one year. Honorary members will not have voting privileges.

SECTION 4. Eligible persons residing in the same household may be granted full membership privileges by payment of $1.00 provided that one member of the household has paid full annual dues. All members of the same household shall have the same anniversary date.

ARTICLE IV – MEMBERSHIP PLEDGE

Each member shall pledge himself to adhere to the best of his or her ability to:

a. All applicable FCC rules and regulations.

b. The requirements of this constitution.

c. The By-laws.

d. The code of ethics adopted by the club.

ARTICLE V – VOTING PRIVILEGES

All full members shall have full voting privileges providing they are not delinquent in their dues and assessments.

ARTICLE VI – EXPULSION

Members of the Club may be expelled in accordance with such procedure as may be established in the bylaws for violation of this constitution, violation of the code of ethics of the club, or for other conduct which would tend to cause discredit to fall upon the club or upon amateur radio as a whole.

ARTICLE VII – RESIGNATIONS

Any Member has the prerogative of resignation from membership in the club and any resignation will be recognized and accepted when submitted to the Secretary in writing. Resigned members will be restored to the Club prospective membership list upon use of the corporations owned equipments.

ARTICLE VIII – GOVERNMENT

The government of the club shall be vested in the Officers of the club. The Officers of the Club shall be the President, Vice President, and Secretary-Treasurer.

ARTICLE IX – MEETINGS

SECTION 1. Regular meetings shall be held as determined in the by-laws. A Quorum shall consist of 10% of the members.

SECTION 2. Special meetings may be called for any purpose by any Officer of the Club who shall preside over the meeting. A Quorum shall consist of 10% of the members.

ARTICLE X – AMENDMENTS

This constitution may be amended in the following manner:

a. Any proposed amendment shall be first presented at any regular or special meeting for approval.

b. Proposed amendments approved by a majority vote of the members present at any regular or special meeting will be submitted to the entire membership for a vote to adopt proposals.

c. The Secretary-Treasurer will mail proposed amendments in the form of a voting ballot to the entire membership. The ballots shall include a self addressed envelope plainly marked to indicate ballot.

d. Deadline date for return of the ballots to the Secretary-Treasurer will be plainly indicated on the ballots and return envelopes and must be at least five days prior to the next regular meeting.

e. The Secretary-Treasurer will open the ballots and determine the results of the vote. A two-thirds majority vote of the membership shall be required for approval.

f. If approved, the proposed amendment becomes effective immediately.

ARTICLE XI – CLUB OWNERSHIP RIGHTS

The Club shall have the privilege of owning property both real and personal and the right to buy and sell in the club name according to the provisions of the by-laws.

ARTICLE XII – CLUB STATION RIGHTS

The Club shall have the expressed right to establish and maintain a club station and to establish operating procedures within the privileges granted by the FCC.

ARTICLE XIII – TRUSTEE

The position of Trustee shall be filled as determined by the bylaws.

The constitution should show the acceptance date and must be signed by the Club Officers and two witnesses.

The bylaws are where all the action is, and they should cover every forseeable circumstances. As mentioned before, changes will drive the Officers and Members right up the wall. A fairly complete set of bylaws will look like this:

BYLAWS:

ARTICLE I – CERTIFICATION OF MEMBERS

Upon receipt of application for membership in the club, along with the required dues and information required, the Secretary-Treasurer shall furnish the member with certification of membership in the form of a membership card.

ARTICLE II – OBLIGATIONS AND PRIVILEGES

SECTION 1. Club Obligation: It shall be the duty of each member to support the club with his participation, attendence, time and money to the extent that he feels obligated to help make a success of the organization.

SECTION 2. Code of Ethics: Each member shall endeavor to abide by the Amateur Code of Ethics to the best of his ability.

SECTION 3. Privileges: All members are urged to enjoy all privileges of the club as outlined herein and as offered during the existence of this club.

ARTICLE III – DUES AND ASSESSMENTS

SECTION 1. Each member is required to pay annual dues at the time of joining the club and at the end of yearly intervals thereafter. The annual dues shall be $12.00 which may be paid in the calendar quarters by Transient Persons, Students and Senior Citizens.

SECTION 2. The Secretary-Treasurer will notify all members of their expiration dates and the date which they become delinquent.

SECTION 3. Any delinquent member maybe reinstated at any time. His anniversary date will be changed to reflect the date of reinstatement if the deliquency exceeds three months, providing the delinquent member has not used the corporations equipment during the delinquent period.

SECTION 4. Family members annual dues shall be $1.00. Family members are those persons who reside in the same household as a full member who is the head of a family. All members in the same household shall have the same anniversary date. Family members shall meet the requirements of full members under Article III of the Constitution.

SECTION 5. Special assessments may be voted by two-thirds of the membership, provided however, the entire membership is notified in writing the purpose and amount of the proposed assessment at least thirty days prior to the meeting at which the assessment is to be voted upon.

ARTICLE IV – ELECTION OF OFFICERS

SECTION 1. On or about September 1st of each year, the Secretary-Treasurer shall notify all members of the club that the annual election of Officers will be held at the regular meeting of the club during the month of October.

SECTION 2. The term of office of any Officer of the club shall be One calendar year, beginning January 1st and ending December 31st.

SECTION 3. Any Officer may succeed himself in office, if elected.

SECTION 4. At the regular meeting in the month of October, the presiding Officer will accept nominations from the floor. An election will be held and the candidate for each office who receives the majority vote of the members present is elected. Secret ballot will be used.

SECTION 5. Nominees for office shall give their approval before becoming a candidate for office.

ARTICLE V – DUTIES OF OFFICERS

The duties of the Officers shall be such as their titles by general usage would indicate. Specifically, the President shall preside at all meetings. He is an ex-officio member of all committees. He is the spokesman for the club at all official functions. The Vice-Presidents duties shall be to take over all the duties of the President in the absence of the President. He shall have all the authority of the President when acting in the Presidential capacity. He shall assist the President in all activities and purposes of the club. The Secretary-Treasurer's duties shall be to keep the minutes of each meeting. He will keep an accurate financial record for the club. He shall file all reports and documents required by any governmental agency. He will be held personally responsible for the funds entrusted to him and give an accounting to the club on request. All officers will, upon the completion of their term of office, turn all properties belonging to the club to their elected successors and assist the succeeding Officers to learn the necessary tasks required for good government of the club. The Secretary Treasurer will give an accounting of the club members on request.

ARTICLE VI – TRUSTEE

The Trustee position shall be filled by Walt Hoban WA5XXX, until such time that he or the club, by a majority vote at any regular meeting, determines that the office be filled otherwise.

ARTICLE VII – DUTIES OF THE TRUSTEE

The trustee shall be charged with the responsibility of caring for the physical property of the club, as well as acting in the name of the club in matters that may require official trustee action with the approval of the governing body.

ARTICLE VIII – VACANCIES

SECTION 1. A vacancy in the office of President shall be filled by the Vice-President.

SECTION 2. A vacancy in the office of Vice-President or Secretary-Treasurer shall be filled by a majority vote of the members present at a regularly scheduled meeting or at a special meeting.

ARTICLE IX – COMMITTEES

SECTION 1. An Executive Committee shall be established as a standing committee. This committee shall consist of the Vice-President, Secretary-Treasurer, and Trustee. Duties of this committee are to act for the club under the provisions of Article XI of the Constitution and Article XIII of the bylaws.

SECTION 2. Special or Standing Committees may be appointed by the Presiding Officer at regular or special meetings that may be necessary. These committees will function for the club's advantage and will be terminated upon completion of the assigned tasks.

ARTICLE X – MEETINGS

SECTION 1. Regular monthly meetings shall be held at a time and place announced by the governing body. Notification of the membership will be by the best means available under the circumstances.

SECTION 2. Special meetings may be called as prescribed by the constitution.

SECTION 3. Robert's Rules of Order, latest edition, shall be recognized as the authority of procedures governing any regular or special meeting, when not in conflict with the constitution and these bylaws.

ARTICLE XI – EXPULSION

A member may be expelled from membership in the club in the following manner:

a. Proposed expulsion of a member shall be openly discussed at regular or special meeting and the reasons for expulsion explained.

b. The Secretary-Treasurer shall notify the affected member at least seven days in advance of the next regular scheduled meeting, at which time a vote of the members will be taken.

ARTICLE XII – CODE OF ETHICS

A code of ethics, modeled after the code of ethics of the American Radio Relay League, shall be approved and adopted, and adhered to by the members of this club.

ARTICLE XIII – OWNERSHIP AND TRANSFER OF PROPERTY

The club may own property as provided by in the Constitution. Any purchase or sale of club property must have the approval of the majority of the members present at a regular or special meeting. This does not exclude the Trustee from making or authorizing others to make repairs to the station equipment or any corporation owned property to keep said properties fully operational. The operating budget of the Trustee will be approved by two thirds of the membership present at any regular meeting.

ARTICLE XIV – APPOINTMENT OF CHAIRMAN AND COORDINATORS FOR SPECIFIC TASKS

The President shall appoint members to tasks of chairmanship and coordinators to enable this club to accomplish those necessary for the good of the organization. These job titles will be: EMERGENCY COORDINATOR EDITOR of the CLUB BULLETIN, PARLIAMENTARIAN, CLUB AMBASSADOR, and REFRESHMENTS CHAIRMAN. These persons will be directly responsible to the Executive Committee and will attend Executive Committee meetings as invited.

ARTICLE XV – DUTIES OF EMERGENCY COORDINATOR

The Emergency Coordinator shall:

a. Conduct the Sunday Night Round-up Contest and insure that proficincy of the systems of the corporation is in keeping with the public interest. He shall insure that the rules of the contest are current and applicable for various contingencies in which Amateur Radio may assist.

b. Maintain a pyramid alert system of mobile and transportable radio stations that can fulfill existing communications requirements for this local area of this club. He will insure his own and his replacements availability to meet requirements of severe weather and disasters in which amateur radio can assist.

c. He will conduct a test of his alerting system adopted by the club at noon on Saturdays.

ARTICLE XVI – DUTIES OF EDITOR OF THE CLUB BULLETIN

The EDITOR shall:

a. Accumulate, edit when necessary, and publish news from the national magazines for Amateur Radio.

b. He will canvass the Club Officers for material for the clubs bulletin.

c. He will insure that the bulletin is published in a timely manner at the lowest available cost and that the size will fit the mailing budget of one ounce first class to each member, prospective member, exchange club bulletins, and all editors of VHF-FM Columns in the national amateur radio magazines.

d. The Editor will also perform all other publicity tasks in the best interests of the club.

ARTICLE XVII – DUTIES OF PARLIAMENTARIAN

The Parliamentarian shall:

a. Decide all questions of order at regular or special meetings.

b. He shall interpret and enforce Robert's Rules of Order at all meetings.

c. Assist the Secretary-Treasurer in maintaining the card file of prospective members by noting new stations which use the corporations equipments and forward call sign, name and address, and date that the systems were used.

ARTICLE XVIII – DUTIES OF AMBASSADOR

The Ambassador shall:

a. Attend all area, regional, and local coordinating group meetings scheduled for the betterment of VHF-FM.

b. File written report with the Secretary-Treasurer upon completion of scheduled coordinating group meetings.

c. Read the written report at the next regular business meeting in the category of old business.

ARTICLE XIX – DUTIES OF REFRESHMENTS CHAIRMAN

The Refreshments Chairman shall:

a. Provide coffee and donuts at all regular and special meetings from the resources of the club treasury.

b. Insure timely preparation of the refreshments at all meetings.

ARTICLE XX – CONTROL STATIONS

Control Stations for the corporations equipments will follow guidance established by the club station Trustee. The guiding information will be called the Standard Operating Procedures for Control Stations. Control stations allowing error or violation to occur will be placed in probationary status. Control Stations with three or more documented errors or violations will be removed as a Control Station and will return all corporation property to the Trustee.

ARTICLE XXI – FINES AND LITIGATION

All responsible members and prospective members and users of the corporations owned equipments will file their employer information with the Secretary-Treasurer. This information will be used to recover expenses and fines incurred by violations of the Federal Communications Commissions Rules and Regulations. This bylaw establishes an automatic lien on wages, salaries, and other compensation paid to any member, user, or other involved third party when using the corporations equipments.

ARTICLE XXII – NON-PAYMENT OF DUES BY PROSPECTIVE MEMBERS

Prospective members and users of the corporations equipments who decline to pay the annual dues after six invitations shall be remanded to the "LOSERS LIST." This list will be prominently displayed at all regular meetings of the club. All members are discouraged from engaging or contacting listed non-paying persons through the corporations owned equipments. This bylaw is void during emergencies as declared by the non-paying persons.

ARTICLE XXIII – HONORARY MEMBERSHIP FOR DEALERS AND OTHER COMMERCIALS

Any person in the category of DEALER, COMMERCIAL ENTRANT, or other, and any and all relatives thereof shall be tendered honorary membership with all rights and privileges thereof. This includes those persons who are engaged in the radio, electronics, and allied businesses as a dealer, importer, wholesaler, broker, or manufacturer, and all their relatives. Further defined, this shall include those persons who possess State Sales Tax Permits and who file Internal Revenue Service Schedule "C" in the conduct of their business. Relatives includes persons residing in the same household as the above subject individuals.

ARTICLE XXIV – TONE ALERT SYSTEM

The adopted tone alert system shall consist of 1000 Hz signal of ten seconds duration. This tone will be used to alert the membership of severe weather and disasters through the corporations equipments. All members are encouraged to use apparatus to intercept the tone alert.

ARTICLE XXV – NAMEBADGES

All members are encouraged to display the clubs adopted namebadge at all meetings and functions of amateur radio. The namebadge be red and biege with the state emblem.

ARTICLE XXVI – RECRUITING NEW MEMBERS

The Secretary-Treasurer will send an invitation-to-join letter to all prospective members and users of the corporations equipments. He will note on the card file cards the dates that the letters are sent. Prospective members and users who decline to join will be remanded to the losers list in accordance with Article XXII of these bylaws. Invitation letters will be monthly and not with the club's bulletin.

ARTICLE XXVII – SUNDAY NIGHT CONTEST RULES

The Emergency Coordinator will initiate the Sunday Night Round-up contest usually only during the summer months or during the period when daylight saving time is in effect. Specific rules as follows:

a. Contest rules will be transmitted on frequency to all participants.

b. Executive committee will be umpires for point subtraction.

c. Contest area will be restricted to Tarzanial County.

d. The Contest Control Station operated by the Emergency Coordinator will record starting and ending mileage of participants.

e. Participants are encouraged to use procedures that expedite message handling and circuit traffic.

f. All participants must be mobile stations.

g. SCORING: Participants scores are determined as follows:
Signal 82, accident with injury, 100 points – Signal 76, collision with any object, no injury, 75 points – Stop signs missing or knocked down, 50 points – Signal lights malfunction or inoperative, 50 points – Power lines on the ground, sparking or arcing, 50 points – Fire, building, grass or smoke hazard, 25 points – No barricade at manhole cover off, excavation, etc., 25 points – Stalled or illegally parked vehicle in traffic, 25 points – Trees, weeds, or vandalism covering traffic signs, 25 points – Warning flasher lights no working, 25 points – No barricade at chughole in traffic lane, 10 points – Debris, glass, gravel, tree limbs, trash in street, 10 points – Loose domestic animal, horse, cow, dog, 10 points – Dead domestic or wild animal in traffic lanes, 10 points – Loud outside burglar alarms, 10 points – Street marker sign down, missing, or vandalized, 10 points – Natural gas odor, 5 points – Mileage, points per mile 5.
SUBTRACTED POINTS:
Improper location transmitted -25 – Doubling over the frequency in use -25 – Improper procedure -10 – Low audio quality -5.

h. Contest winner will be the mobile station with the highest point total.

i. All contest point standings announced at conclusion of contest.

j. Contest period will generally be two hours, from 7PM to 9PM.

k. Contest session automatically terminated in the event of disaster.

ARTICLE XXVIII – AMENDMENTS

These bylaws may be amended by a majority vote of the members present at any regular or special meeting of this club.

Having a proposed set of Constitution and Bylaws does not mean that you will be able to get them adopted by the membership. The experience of the local club indicates certain areas of question which result in much haggling. A big problem area seems to be the reasonable amount of membership that constitutes a Quorum.

A big argument for having 10% as the quorum is simply because that is what it is in the U.S. House of Representatives. Just as sure as you make it larger, there will always be some major event that will conflict with a very important meeting date. The major event may be anything from the county fair to the new TV show season. Keeping the quorum small probably results in larger attendence at the meetings since more persons will attend just to make sure that a minority will not run away with things of the corporation. As you can see, big haggling area is needed when it comes to discussions about the quorum.

Another head clunking deal is the honorary memberships for the dealers and commercial entrants who are in the radio business. A likelihood exists that these persons may very well be some of the biggest supporters of the local repeater, however; they are also the same persons who the lobbyests can get to should the pressure be increased to "end amateur radio." Recent magazine articles have dealt with this subject with articles such as "Amateur Radio's Last Year," and "Sneaky Proposal." It may cost your club a lot of money from the standpoint of free membership, but that is probably better than no club at all for amateur radio in two or three years.

Much teeth gnashing can be caused by the Control Station bylaw. The question is, just how do corporations handle this multi-headed monster of a person acting in behalf of the Trustee who in turn is designated with responsibility of the corporations interests? Catch on to that snakey deal. The Trustee is appointed by the club. Every thing he does is in accordance with the FCC rules and regulations. That includes appointment of the control stations. The event of a control station making quantities of booboos and getting cited more than once must be covered in the bylaws. Such a bylaw may make it difficult to get volunteers to act as control stations, but that simply is the breaks of the game and another reason to write your Congressman about the unreasonableness of the FCC. To remove a control station and add a new one costs $8.00. Cannot allow that to happen too many times in any one club.

A similar problem area covered in the bylaws is concerned with fines and litigation. Hopefully, no repeater group will ever get into a four way lawsuit. This would be a simple case of perhaps profanity or broadcasting, and involving some user of the corporations equipment, the Trustee, a control station, and the Feds. The Federal rules and regulations seem to put the monkey on the Trustees back, but in reality, it will always be the user who will actually committ the violation, and do so quickly in a manner that the control station doesn't have time to hit the kill button. Simply, the corporation here is not ready to pay some one's fine. The corporation was not organized to protect the hard case or semi-nit wit, but to enable operation of a repeater.

It has already happened here and likely has in other places. The circumstance was a cold winter day and a hard to start auto. The unknown subject apparently had two radio equipped autos, and had the woman of the house, likely unlicensed, operating the vehicle in tow. Needless to say, when she did not operate the brakes at the proper moment, there was much profane advice and directions given.

All the luck in the world to you and yours in your Repeater Government.

...W5OJZ

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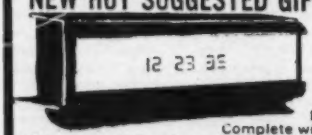

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THE HEATH

HWA-202-1 AC Power Supply

The HWA-202-1 power supply is intended for use as a companion unit for the Heath HW-202 2 meter FM Transceiver when that rig is operated at a fixed QTH where ac power is available. However, the features of this supply also make it a very fine general duty, 12 V, 2 ampere source for operating miscellaneous solid-state receivers, converters, amplifiers or experimental circuits on the bread board.

Output voltage is internally potentiometer adjustable from 10 to 15 V and is completely regulated within 1½% from no load to full load (2.2 amps). In addition to conventional circuit breaker protection, the unit is electronically protected from current overload (short circuit) by the integrated circuit sensing arrangement which is the heart of the regulator circuitry. Voltage from the ac plug up to the dc regulator is a conventional transformer-diode bridge rectifier capacitor filter circuit. . .but between this point and the output connector is a large regulator transistor whose emmitor – collector path is in series with the power supply's load. The base of this transistor is biased by the IC output which is determined by its comparing a zener diode referençe voltage with that of the output voltage.

This Photo shows diode D4 with cathode band painted on wrong end.

Assembly of the kit is very simple and can be accomplished in less than 2 hours. Most of the components are mounted on a small etched circuit board and this accounts for the rapid assembly.

Upon completion of my power supply, I plugged into a nearby ac receptacle, placed the unit's power switch to the ON position. . .and promptly popped the circuit breaker. This bordered on discouraging. I rechecked the wiring. Nothing. I checked for cold or bridged solder joints. Nothing. I checked the marked polarity of the electrolytic capacitors and diodes. Looked OK. I rechecked the wiring. Nothing. I unsoldered the transformer leads and measured resistances in a search for shorted windings.

Checked OK. I rechecked the wiring. Nothing. I removed the regulator transistor and made emitter to base and base to collector resistance readings. Read OK. I rechecked the wiring. By now the power supply was almost back in the unassembled condition that I had started with two hours earlier! Finally, while checking the front-to-back resistance of the diode rectifiers, I discovered a curious thing. . .one of the diodes had the *cathode band painted on the wrong end!* After turning the diode around (and reassembling the power supply), everything worked as advertised. In all of my years in electronics, this was the first time that I ever encountered a mismarked component, and it was certainly not the fault of the Heath Company, but it is something to look for when almost all else fails.

As a final check prior to placing the unit in service, I connected an oscilloscope to the output leads and, with the vertical sensitivity at .05v/Cm, was unable to detect any ripple component of the dc voltage. Under load, using an HW-202 in the transmitting mode, less than 10 millivolts peak-to-peak ripple was observed, which for practical purposes is negligible.

Priced at $29.95, the HWA-202-1 rates a "good buy" as an accessory unit for the HW-202 transceiver, which it matches in size and style, and as a well regulated 12 V source for the ham shack.

. . .W3WTO

HOW TO BE SURE THAT HAM RADIO HAS A FUTURE

Gabe Gargiulo WA1GFJ
17 Whitney Street
East Hartford CT 06118

The best way to protect something is to get someone powerful to look after it. The fact that you, the ordinary person, want to safeguard amateur radio means nothing. The only way to guarantee a future for ham radio is to get business behind it. Look at what the electronics manufacturers are doing to keep and expand CB!

Big business is not going to care one hoot about ham radio if you tell it how great and wonderful ham radio is, or what worthwhile things are accomplished on the air. They will begin to care only if the outlook is good for profit.

Yes money – the root of all evil. That is what will make company presidents sit up and ask, "What in hell is ham radio?" If they realize that there is money to be made on the hobby of those crazy nuts, they will take pains to protect it. Money will be spent to influence legislation on our behalf. Subtle pressures will be felt by government officials at all levels. Better yet electronics manufacturers will continue to produce ham gear at competitive prices. They will promote ham radio and introduce young people to it. All this will expand the hobby and cause it to grow.

Nice – but it won't happen unless some money starts to flow into the treasuries of the makers of ham gear. This means that you, Joe Ham, must get out and *buy*. Purchase ham gear. Buy new equipment. Don't spend your money on cigarettes. Forego the luxury of a new air-conditioned car. Instead, buy a quad and a 40 foot tower.

Buy! Buy new transceivers, receivers, transmitters, antennas. Get into two meter FM and ATV. Get that scope you always wanted. When your wife asks where all the money is going, tell her that it is to insure that ham radio has a future, and to protect your investment in all that expensive equipment. Remember, you aren't wasting money or indulging yourself – you're only protecting your investment. Besides, you're helping to creat jobs in the electronics industry.

How can you resist now, knowing all the benefits of buying more radio gear? Just thumb through this magazine and you'll find page after page of luscious goodies just waisting to be bought. Protect your investment. Be sure ham radio has a future. Buy. Buy. Buy.

. . .WA1GFJ

Peter A. Stark K2OAW
P. O. Box 209
Mt. Kisco NY 10549

A Simple 5V Power Supply For Digital Experiments

Now that some 7400-series TTL (transistor-transistor-logic) digital integrated circuits are available for as low as 20¢ apiece digital projects are getting more popular among hams. Here's just the right power supply to make your digital experimenting easier.

As shown in Fig. 1, the supply consists of a simple bridge rectifier, fairly heavy filtering with two 2200μf electrolytics, and regulation with an LM309K integrated circuit regulator. As shown in the photos, the LM309K is mounted on an aluminum heat sink right on the case (the ICs case is grounded so no mica insulators are needed). With such a heat sink the circuit will provide up to 1a at 5V. With the IC mounted just on the case, but without a separate heat sink with fins, the maximum current output will be somewhat less, but probably still above ½a.

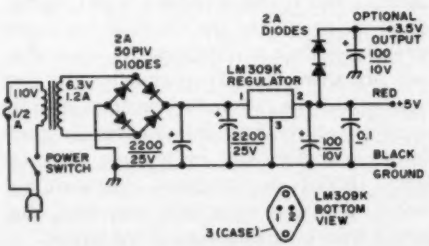

Fig. 1

The secret of the circuit, of course, is the regulator IC. Not only does it provide excellent regulation and practically eliminate any ripple on the output, but it is also short-circuit proof – you can short the output of the supply and no harm will be done. It also shuts itself off in case its temperature gets too high, in other words, no damage will be done if you skimp on the heat sink – you just get less output current before it shuts off.

The 5V output is perfect for 7400-series and other TTL ICs, as well as most DTL and ECL circuits. Since RTL ICs need only about 3.6V, you can add an optional output for these ICs by just adding two diodes and one more electrolytic.

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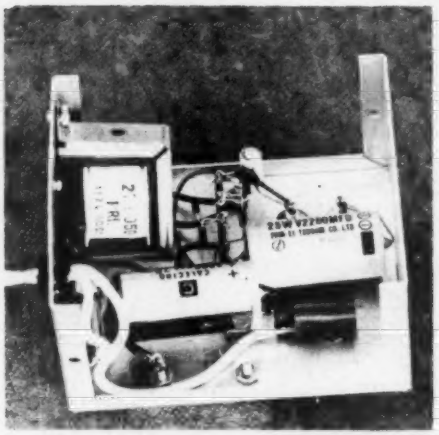

Fig. 2. Inside the K2OAW power supply.

To reduce power supply feedthrough of logic signals from one circuit to another, place the 100μf and 0.1μf capacitors as close as possible to the two output terminals, and use short leads. In addition, don't forget that TTL ICs generate very short spikes on their power supply lines, and therefore you will need additional bypassing inside your circuitry itself. Every four or five ICs (at the most) should have their own 0.1 or 0.01μf disk capacitor connected directly from the +5V line to the nearest ground, using the shortest possible leads. These additional capacitors should be as close to the ICs being filtered as possible. In really severe cases, you may have to connect these capacitors right at each IC.

Chances are good that you won't need a bigger supply than this; we've used it to power a frequency counter with over 30 TTL ICs which only took slightly more than ½a. Not many projects will ever need more than 1a. But if you do need a bigger supply, don't try paralleling the LM309K regulators to increase their current capacity, since they will not share the current equally. The best bet would be to make several separate supplies, which share only a common transformer, rectifier and brute-force filter (at least 4000μf per ampere). Each output would then be separately regulated, and would drive a separate part of the circuit.

. . . K2OAW

F. H. Ryder VE1AIL/GT
Bsc M. Eng. P. Eng.
(M) IEEE C. Eng. FIEE
VE1AIL, VE1GT, XM65-2239

THE WET NET

The Saint John River rises in the State of Maine, and flows half of its total length northward to the very tip of Maine, then turns southward and flows through the west and central part of the Canadian Province of New Brunswick.

There are no flood control dams on the Saint John River in northern Maine, a conservationist's paradise, and consequently, by the time a large rainfall in Maine reaches New Brunswick, little can be done except "run for the hills." This can be done quite easily on most stretches of the river, with one exception; just east of the capital city of Fredericton, the northern bank of the river flattens into a flood plain which forms the market garden area of central New Brunswick. Slightly more than 1000 dwellings and about 150 farms are located in the 40 mile stretch of interval land. Most years the St. John River floods its banks and gently submerges the area. When the water subsides the further enriched thick black soil will grow most anything – fast!

On the last weekend of April 1973 such a gentle innudation was taking place, however, in Northern Maine and New Brunswick the equivalent of an additional eight inches of water lay in the woods in the form of snow. On Saturday, April 30, Northern Maine and Northern New Brunswick experienced in the order of 2½ inches of warm rain which would have been bad enough in itself but it also melted the snow and to repeat a famous saying, "then the fun began." Within four days, the previously recorded record flood level in Maugerville – Sheffield set in 1887 was exceeded by some three feet and previously accepted levels of preparedness for flooding were proven to be inadequate.

The Emergency Measures Organization (EMO) here in Canada has of recent times been giving more serious consideration to civil emergencies of reasonable magnitude and probability. In early 1973, the New Brunswick Amateur Radio Association was asked to define what sort of communications capability could be provided in an emergency and in due course a brief was prepared and presented to EMO.

Little was it then realized that less than three months after completing that report, it

would form part of the discussion papers during the organizational meeting of a massive flood rescue and relief operation.

The Flood Forecasting Task Group is a joint effort of Federal and Provincial Departments of the Environment and N. B. Power, an electric utility with hydro generating stations on the river. This year the task group was located in an office of N. B. Power and fortune dictated on that wet Saturday evening that I visit the task group and come upon the organizational meeting of the rescue operation. In due course, the opportunity was given to define once again the services that could be provided by Radio Amateurs and within one hour the "Wet Net" was in operation on 80 meters with VE1TC, BM and ACA alternative as net control and on two meters a station was set up in one of the N. B. Power offices taken over by EMO for the emergency operation; this gave us a completely independent communications link with the EMO office should the telephone circuits become inadequate.

It was emphasized to EMO officials that our automatic repeater VE1GT gave solid coverage of the low lying area and that we could assure direct communications with their field staff anywhere in the area. As a test of this VE1AJT (now AKT) a hand held unit was dispatched with a helicopter patrol unit early Sunday morning and provided the EMO official doing the patrol with communication *directly* with his confreres in the office.

On Sunday morning the record flood was still only a forecast and the water in Maugerville – Sheffield was as yet some feet below previous record levels. A road patrol was then mounted using a large utility vehicle, with VE1AEK, (now HL) in operation.

N. B. Dept. of Agriculture representatives were on board and the purpose of the patrol was to advise each farmer of the impending increase in the water level and to evaluate the situation of each so that subsequent rescue operations would be as effective as possible. The patrol barely made it back, with water well up on the tires and sitters on the front fenders peering down through the water to ensure that the driver stayed on the road.

The rest of the day was spent in preparation for rescue by means of scows, barges, ferries and military amphibious vehicles.

There is a saying "Nothing like good service is so effective in increasing the demand for that service." I won't say how good our service was but we began to get swamped with demands. Hand held units were required on board the rescue craft and base stations were required at the marshalling points where livestock was to be transferred to transport trucks. This was obviously beyond the resources of Fredericton Amateurs and a call for two meter equipment and operators for 24 hour a day operation was made on 80 meters. And did it come? You bet! A contingent of 9 from Saint John led by Ken VE1AVA and one of 6 from Moncton area led by Ron VE1SH and Reed VE1NU, who brought walkie-talkies, Don VE1DK came 300 miles from Truro, Nova Scotia to lend a hand; this gave us a total of 33 operators. Ken and Ron covered the marshalling points at Burton, across the river from Maugerville and the others manned the boats. The object being that anyone requiring assistance could get it with the least possible delay. A battery of telephones had been installed in the EMO temporary headquarters and from this co-ordinating centre rescue craft were dispatched from the Burton marshalling point by amateur radio. The net also proved of value to the rescue craft when one got both propellors tangled in a barbed wire fence and another lost its engines and grounded.

I would be remiss in not mentioning the part played by the several GRS (CB) clubs in support of the operation. Base stations were in operation both at Burton and the EMO Headquarters on a 24 hour basis and many CB equipped small patrol boats made reports of conditions. Many of the transport trucks hauling livestock were CB equipped and were more effectively dispatched than would otherwise have been possible, particularly as the scows would often miss their scheduled landing wharf and be swept downstream to the next one. Much co-ordination was needed to get the trucks and the scows to the same wharf.

The rescue operations were complicated by the fact that to reach the barnyards

Rescuing a reluctant cow.

rescue craft had to cross over the highway, covered by only 3 to 4 ft. of water and consequently, only very shallow draft vessels were of use. The operation continued through Monday, Tuesday and Wednesday, dawn to dark; navigation on the river after dark was too risky.

Government offices and the legislative buildings also suffered from the flood, and we soon found that the Premier's temporary office was just down the hall and he, as well as various ministers, came in from time to time to inquire about various things and were briefed on the role of amateur radio in the emergency effort, in addition to getting the answers they came for.

On Tuesday night the 200 prize cattle of Gerald Hoogendyk stood on dry land with a foot to spare. On Wednesday morning, they stood in icy water belly high when the Second Field Artillery came to take them out. By now these cows were in panic and the sound of roaring motors as the soldiers executed an aquatic roundup was drowned out by bawling cows and calves. Often the men were obliged to jump into the icy waters to assist an animal to get on board the scow. At Waterbury's farm, having rescued the 30 cows from the corral, one brave lad went in to get the 1800 lb. bull and was promptly thrown out through the fence. Doug Nielson, the EMO Rescue Co-ordinator, 6'4", 200+ lbs, then went in and after running the bull around the corral several times made for the scow. Both he and the bull got on all right but couldn't get stopped; two cows and several soldiers were pushed right over the other end of the scow. A helicopter patrol later reported seeing a scow crossing the river with 30 cows and a group of soldiers crowded up in one end while a large bull glowered at them from the other.

At Henry Shuttenbeld's farm, there was another problem of slightly different dimension: 300 pigs, and time was of the essence in this evacuation because pigs can't stand cold water very well. It was the same thing all over with the action speeded up to almost comic proportions to the tune of the high pitched squeal of the pigs.

Communications by now had been worked down to a simple routine, with operation on 94 simplex between the rescue craft and Burton, and via VE1GT for other operations. On Thursday morning we were advised by EMO that since things were now tapering off they wished to rely on the commercial and military communications systems for the balance of the Maugerville – Sheffield operation.

The crest of the flood was now proceed-

ing towards the City of Saint John on the south coast of New Brunswick and both the EMO and the radio amateurs turned their attention to this city, 70 miles south of Fredericton. The Saint John EMO office had limited telephone access and this was soon jammed so the two meter station of Dick VE1ATG was set up and a relay maintained through the 80 meter Wet Net. Phone patches proved useless because of jammed phone lines but a 2 to 80 meter patch made by alternately holding speaker to microphone enabled a direct relay at one point when such was needed to precipitate action.

By Friday noon, the danger of further flooding was passed and all amateur operation in support of EMO ceased.

To emphasize the magnitude of the operation, some 1500 people were temporarily relocated and 1200 cattle, 400 pigs and 20 horses were rescued with the loss of only four and with no loss of human life or major injury.

In conclusion, there are several observations on emergency communications that can be made on the basis of this operation:

1. The amateur is there to provide a communications service and not to involve himself in the operation, that's the problem of the emergency officials. Just pass the traffic and give them direct access when they need it to sort out a difficult problem.

2. The most ineffective repeater has a pair of ears and a mouth. Traffic handling is one area where hams as well as CBers alike fall down; for this reason, and my observation that emergency officials seem to prefer to be able to talk directly to their counterparts, I recommend that when such a need is evident HF-VHF and CB patching be used where repeater links do not exist.

3. Frequencies and repeaters used in the emergency must be kept free of chatter. It gives a terrible impression unless the stations interfacing with the emergency organization uses earphones and net control quiets everybody down while the emergency officials are at the mike. This is hard to do on VHF, worse on HF and well nigh impossible on CB.

4. Patrol vehicles must report what they see, without assumptions, or opinions, and do it briefly, clearly and slowly. Many a wild goosechase has been precipitated by the embelleshment of report. Checking up on such reports is easier to do when the reporters can be grilled directly rather through a number of relay stations.

5. It is my opinion that in subsequent emergencies of this magnitude the use of VHF and repeaters is a must. Means must be found to erect temporary repeaters during such emergencies in areas not permanently served and to link them on VHF full time or patch them on HF when necessary, to the emergency control centre. HF has its place for long distance communications and should not be cluttered up with local communication activities. CB has the advantage that there are many portable and hand held units in service today but range must be limited to distances such that the desired signal will not be swamped in the ever present interference.

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L04	.30	H11	.30	26	.40	46	.90	60	.30	H74	.60	L90	1.25	121	.50	155	1.00	173	2.00
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THE GDO AND THE VOM...GREAT! – BUT DON'T OVERLOOK THE XYL!

Robert J. Shebal W8ZKL
306 Potawatomi Blvd.
Royal Oak MI 49073

Every ham is familiar with a few of the more common tools of the trade such as the VOM and the GDO. But I often wonder how many realize what an invaluable but often overlooked accessory the XYL can be . . .

Even though she may not have a ticket, used properly, she may fill the void in the shack and make your operating more pleasurable.

As a for instance, let me relate this lovely incident that occurred at this QTH. Perhaps it will bring a lump to your throat. A definition of love and true affection could not be more dramatic, and if it brings a tear to your eye, it just proves the point.

It was a typical Wednesday evening with the sweet little thing in the living room, eyes glued to the Wednesday night movie on the mahogany knothole. Meanwhile, back in the shack, I tuned for some rare DX that was coming through on twenty meters. Suddenly to my horror the rotor quit on me and naturally in a direction away from the DX. The beam refused to budge.

I rushed upstairs and explained my plight to the XYL, but she refused to leave the movie. Later, during a commercial, she agreed to help. Almost the same instant a flash of lightning and a clap of thunder rattled the house.

Undaunted, she donned her lineman's belt, and at that precise moment – I was so proud of her – she began her ascent up the four inch pipe mast After all, she weighs only one hundred pounds, and the lineman's belt with cutters, pliers, hammer, small crowbar, 25-foot roll of RG8U and a few other things she needed, weighed forty-two pounds.

I watched her as she shinnied up the pipe and I could see her quite well during the lightning flashes, and between rolls of thunder I could hear the rattle of tools as they dangled from the belt.

She yelled at me to turn on the flashlight and shine it at the top. She really didn't need the light to find the top, because the only way to the top was up. Anyway, she knew the way, as she had climbed it many times before. Apparently she was not aware of the price of flashlight batteries.

It had begun to rain quite hard, and I yelled at her to get a move on up there because I was getting wet. She had finally reached the top and yelled down for some light. I told her the lightning was so frequent that she could work during the flashes.

She got excited and dropped a hammer that almost hit me on the head. I told her that for being so careless and since I was getting wet, I was going into the house and dry off. As a nice gesture I watched the end of the movie so I could tell her how it ended as I was sure she would want to know.

When she came in the house she refused to talk to me just because I had yelled at her while she was up on the mast. She wouldn't even listen when I tried to tell her that the movie ended with John and Marcia getting a divorce because John was very mean and unreasonable.

What I originally started out to say is simply that the XYL can be a valuable addition to the shack, although at times they can be a bit difficult.

Since she is still a bit miffed, please don't show her this article. Better yet, I wish this would self-destruct after you read it.

. . .W8ZKL

Earl C. Dunn, Jr. W5LCT
9634 Paula Drive
Corpus Christi TX 78910

SELECTIVE CALLING

(remote activation via FM)

If you are a member of an organization that operates a busy repeater, chances are you monitor the machine only while mobile. At home, the nearly constant conversation is just too distracting. For instance, it interferes with the great old American pastime – TV watching, not to mention that the wife/children/mother-in-law may take exception (sometimes violently) to the "noise." However, it would be nice to receive those calls addressed to you and perhaps special bulletins or announcements – hence *Selective Calling.*

The availability and use of various tone pads for autopatch/repeater control provides a common encoder on which to design such a system. Since tones produced by the "pads" are universally common in a standardized frequency format, only the decoder requires alignment. Assuming your local repeater is equipped with autopatch some or most of the members will have already connected pads in their mobiles.

The design of a decoding device for use at home (or in the mobile) requires consideration of several factors depending on local conditions. First, and most important governing consideration, is the number of discrete calls (addresses) that will be necessary to accommodate the amateurs desiring personal decoders. This consideration will determine the complexity of the decoder since the encoder (tone pad) can produce a vast number of combinations. Second, consideration should be non-interference with the access code of the autopatch. The third objective could be to prevent false activations caused by telephone number combinations. If twelve button pads are in universal use and the autopatch does not employ * or # for access, then the last two objectives are easily accomplished. Actually an access code of four numbers that in effect "tests" the pad by requiring that all seven of the tones be correctly transmitted in order to seize the telephone line is a highly desirable situation, anyhow.

Decoding the dual-tone combinations is done quite simply using the NE567 (Tone Decoder) and the required NOR gates (7402). One NE567 is required for each tone, so it would be necessary to utilize

seven NE567 if the full pad is to be decoded. The decoder presented decodes four of the dual tone combinations with four NE567.

The particular logic to be presented is designed to require four digits in proper sequence within a defined time period and will not accept (for simplicity) two digits side by side – such as XXYY, but will accept XYXY. The mathematical possibility exists for a total of 108 (4.3.3.3) combinations. For example, choose 7, 9, *, and # to be decoded and this is one of the four 27 combination formats.

79#*	7#9*	7*9#
79*#	7#*9	7*#9
79#9	7#*#	7*#*
79*9	7#9#	7*9*
797*	7#79	7*79
797#	7#7#	7*7#
7979	7#7*	7*7*
79*7	7#97	7*97
79#7	7#*7	7*#7

Development of the total combinations (above and Table 1) will reveal two which are all numerals (7979 and 9797) and these can be discarded since they may be part of a telephone number. Also, there are two combinations of no numerals (*#*# and #*#*) which can be reserved for the use described below. Therefore, a repeater group of 104 can be assigned individual addresses. The no numeral combinations can be decoded by all or a portion of the members and used – for example, as net call, emergency reaction group, board of directors net, or any other special purpose. This use of these combinations is important if the system requires expansion. A study of Fig. 1, will reveal that simply moving the 852 Hz decoder to 770

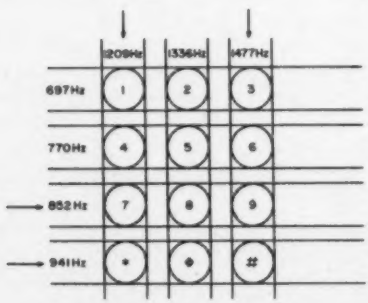

Fig. 1. Tone pad.

97#*	9#7*	9*7#
97*#	9#*7	9*#7
97#7	9#*#	9*#*
97*7	9#7#	9*7*
979*	9#97	9*97
979#	9#9#	9*9#
9797	9#9*	9*9*
97*9	9#79	9*79
97#9	9#*9	9*#9
#*79	#79*	#97*
#*97	#7*9	#9*7
#*7*	#7*7	#9*9
#*9*	#797	#979
#*#*	#7#9	#9#*
#*#7	#7#7	#9#7
#*#9	#7#*	#9#9
#*9#	#79#	#97#
#*7#	#7*#	#9*#
*7#9	*9#7	*#97
*79#	*97#	*#79
*7#7	*9#9	*#9#
*797	*979	*#7#
*7*7	*9*9	*#*#
7#	*9*7	*#*7
*7*9	*9*#	*#*9
79	*97*	*#9*
7#	*9#*	*#7*

COMBINATIONS TABLE

Hz will substitute 4 and 6 for the example 7 and 9 providing an additional 104 combinations still retaining the common no numerals (*#*# and #*#*). Moving the same decoder up to 697 Hz substitutes 1 and 2 thus producing another 104 discrete addresses. The total capacity is 312 individual calls which should satisfy most requirements. Additional combinations are of course possible by adding additional digits and by using pure number combinations.

The digits (decoded dual tones) must arrive in proper sequence and the last digit must arrive within a time limit (2-3 seconds – adjustable) after the conclusion of the first one. An initial digit (logic 1 from the 7402) is applied to the first monostable multivibrator (74121). The conclusion of the tones causes the M/V to begin timing and the $\overline{Q}$ output goes low (logic 0). This frees the first reset-set (R/S) flip flop so that digit two causes it to reset (pin 13 goes low). Now the third digit will reset the second R/S flip flop (pin 4 goes low). With this condition the A input of the second M/V is low and the receipt of a fourth digit initiates its timing cycle. This M/V remains on for about

20-25 seconds while driving the NPN transistor to conduct and close the relay. Contacts of the relay connect the speaker allowing reception of the incoming call. A portion of the last tones transmitted will also be received through the speaker to alert the called party. The manual override is then activated by the operator for normal operation and returned to automatic after the conclusion of transmissions. Fig. 2 depicts the above described logic arrangement to decode any one of the four digit combinations. As already mentioned, if the fourth digit does not arrive before the first multivibrator automatically clears, then the second 74121 cannot begin its timing cycle. This delay time can be extended by changing the 100μf capacitor to a higher value.

Fig. 3 is an example of a four tone decoder with logic output. The interconnecting lines can be translated to a PC board layout if the dashed lines are considered to be jumpers (or the top face of a double sided board). Another construction technique is the use of perforated board and "Circuit-Stik" copper strip interconnects and IC pads. "MOLEX" socket pins provide inexpensive mounting for the ICs. Each NE567 decoder uses the same external com-

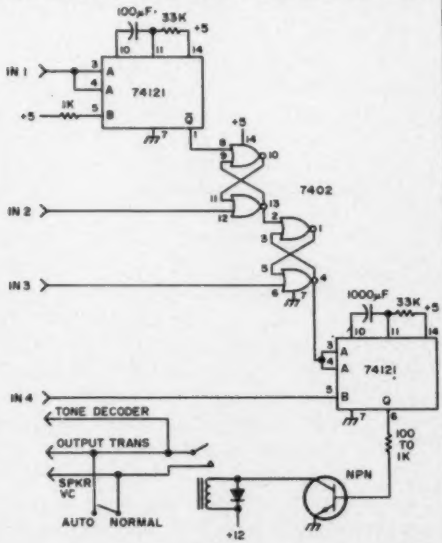

Fig. 2. A control logic arrangement to decode any of the four digit combinations in Table 1.

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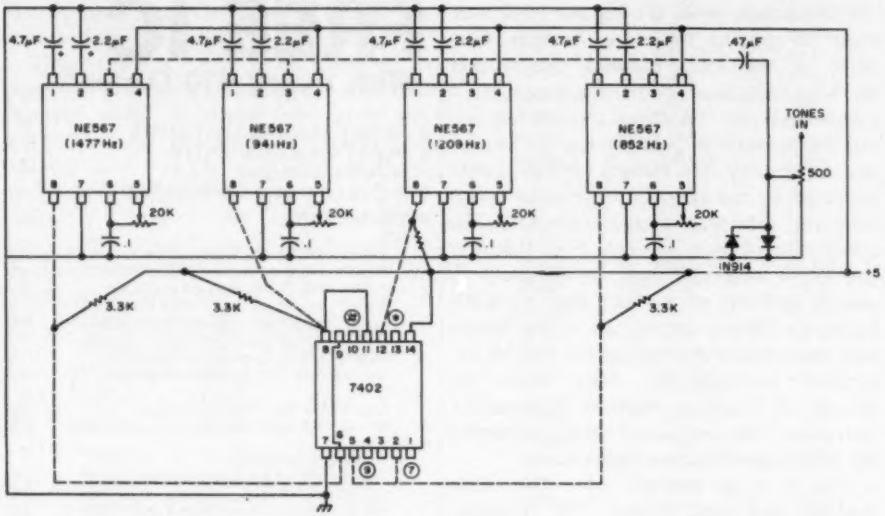

Fig. 3. Tone decoder.

ponents and the frequency is determined by the setting of the 20K mini-pot. The .1 μf capacitors should be mylar for frequency stability of the decoder. The electrolytics need only a 10/15V rating. Tune-up consists of injecting proper single tone at input (many pads will produce a single tone if two adjacent buttons are pressed simultaneously) and adjusting pot on corresponding NE567 for a pronounced dip in voltage as measured on pin 8. Tone input should be 100-200mV and can be obtained easily from the speaker side of the output transformer with level being adjusted by the 500Ω input control. It is not too critical and the 1N914 diodes should protect the ICs from excessive accidental input levels. The NOR gates (7402) combine the outputs of two associated decoders to produce a high (logical 1) at the indicated output pin.

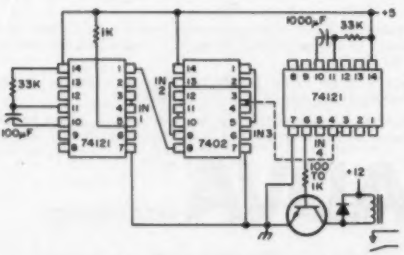

Fig. 4. Control logic.

Fig. 4 is an interconnect of the logic and control transistor which may again be translated to a PC board or other layout. A typical power supply to provide 5V regulated for TTL ICs and 12V for relay is shown in Fig. 5. Eliminate transformer and rectifiers for mobile applications as appropriate.

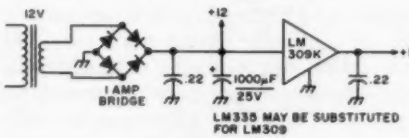

Fig. 5. Power supply.

There are numerous additional possibilities for this control system. For instance, a tape recorder could be incorporated to provide a means for "leaving messages" in case the called party is not immediately available. Relay contacts could start and stop a simple tape machine using its remote microphone contacts. If an on time of longer duration is desired the output M/V can trigger an inexpensive NE555 timer which can be set for long delays. Also, if your group transmits a periodic bulletin, the net call can be transmitted prior to announcements for activation of speakers/recorders.

. . . W5LCT

73 STAFF

REMOVABLE VHF/UHF MOBILE ANTENNAS

There may be many reasons why one would prefer to have a readily removable 2m or other VHF/UHF band antenna on one's car. Such an antenna should, however, be electrically efficient, sturdy enough for usage while driving at turnpike speeds and yet not require any drilling or other marring of the car's surface. Some commercial antennas are available which partially fulfill these requirements. Usually they use a lip type mount and are meant to be placed around the trunk area on a car. But, there are a number of possibilities for the amateur to construct for himself sturdy and economical mobile antennas of the removable variety. This article describes two such possibilities – one in general terms and the type which the author found best in specific detail. The ½ and ¼ λ dimensions which are given apply to the 2m band but these dimensions can be those necessary for any VHF or UHF band.

It may seem at first glance that there should not be much involved to building a simple ¼ λ antenna which mounts, for instance, in a temporary manner on the rain gutter of a car. But, as I found out after many hours of experimentation, there are a number of precautions which must be followed if a really useful antenna is to be constructed. The precautions are not complicated in nature but this article does condense many hours of work concerning both the mechanical and electrical details of constructing a suitable antenna. If followed, the guidelines contained in this article will result in the construction of an antenna providing excellent results on 2m or any other VHF/UHF band.

Where to Mount the Antenna

The best position to mount a mobile antenna is generally the same as for a fixed station antenna. Namely, as high and as in the clear as possible. In the case of a car, this would mean in the center of the roof. A removable antenna can be mounted in such a position without damaging the car's surface by means of a luggage rack holder. A 5/8 λ base loaded antenna mounted in the middle

of a luggage rack holder with the transmission line coming in by one of the car doors, will provide excellent results. But, the installation is certainly unsightly and would not meet any reasonable definition of a readily removable mobile antenna.

Another possibility is the use of a 5/8 λ whip held to the car's roof by means of a magnetic mount. Such antennas can be very efficient but usually the construction of the magnetic mount for the home-brewer is both too complicated and expensive. This is especially true of such a mounting which one would want to depend upon as staying in place under turnpike speeds or when light foliage strikes the antenna itself.

The other possibilities to provide a secure mechanical mount for an antenna while still keeping it as high up as possible on the car, are either a side window type mount or a rain gutter mount. Neither such mounting position places the antenna in the center of the car's roof so there will be some directional effects associated with such mounting positions. But, the directional effects are still less than if the antenna were located still lower on the car's body.

Side Window Mount

One can form a metal bracket which conforms to the dimensions of a side window and slips over the top of the window much like a giant tie clip. The window can still be rolled up fully if the clip fits snugly enough over the top of the window. The outside surface of the clip supports the antenna mounting terminals (insulated from the metal surface of the bracket) and the feedline from the base of the antenna passes through one of the car doors. But, such an antenna must be independent of any ground connection to the car. This is not as impossible as it sounds. Fig. 1, shows the electrical diagram of such an antenna. It consists of a ½ λ vertical radiator connected directly to a 52Ω coaxial transmission line via a 20 pf variable capacitor. The shield of the coaxial cable at the antenna end need *not* be connected to the car body. The ½ λ vertical radiator usually has to be bent a bit sideways and then vertical in order to clear the rain gutter on a car. Once mounted and tuned correctly such an antenna will provide very good performance.

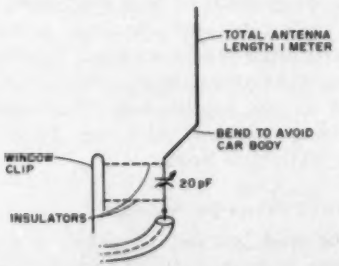

Fig. 1. Window mount ½λ antenna. Coaxial line shield is NOT grounded at antenna base.

Antenna types of this sorts have been marketed and used successfully in several European countries for a number of years for both commercial and amateur radio services! The commercial versions mount the variable capacitor in a plastic housing (which also supports the antenna) on the outside of the window clip and the entire assembly produces a relatively compact and neat appearance. Besides the foregoing, the advantages to the antenna are that the variable capacitor need only be adjusted for the lowest SWR on the transmission line to the transmitter. The disadvantages are that the electrical performance of the antenna is no better than a ¼ λ whip mounted in the same position with a ground connection to the car's body. Also, the adjustment of the variable capacitor will only hold true if the antenna is remounted always in the same position on the car. If mounted in a different position from that for which it was originally tuned (from a front side window to a back side window, for instance), the different reflecting plane the antenna sees will require readjustment of the series capacitor for lowest SWR. A somewhat less disturbing disadvantage is that the transmission line for the antenna must be routed around one of the car doors and either be disconnected at the antenna, or at some intermediate point on the transmission line, when the antenna is removed from the car's window.

I found that the antenna mounting scheme described next was easier to construct and adjust for a temporary mobile situation. However, the ½ λ radiator just described does have a number of possibilities

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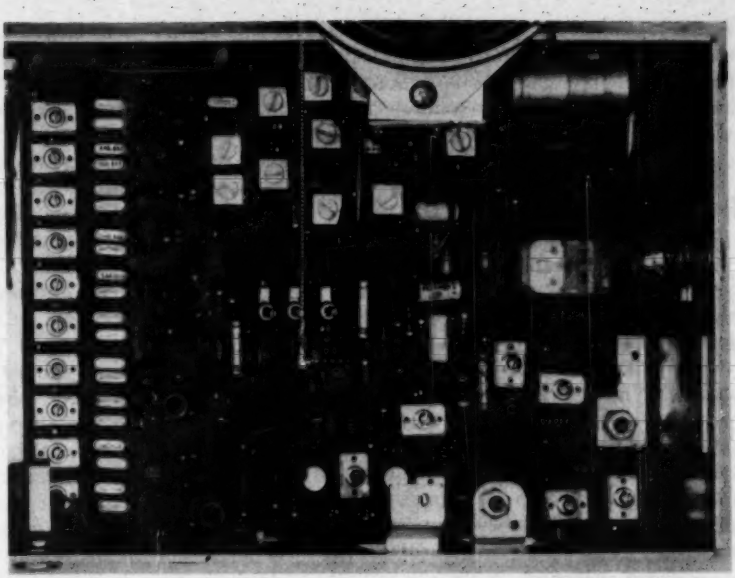

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for *portable* operation which some amateurs might wish to develop further. The lack of a requirement for a ground connection at the antenna end of the antenna transmission line makes it particularly attractive for such usage and it is a proven commercial design.

Rain Gutter Mount

The rain gutter on the side of a car provides a convenient mechanical supporting point for a temporary mobile antenna. To place a ½ λ antenna, such as that previously described, on a mounting which secures to the rain gutter at one point would probably place too much mechanical stress on the mount. This is particularly true for a 2m antenna. However, if one can develop a good ground connection at the point at which an antenna is attached to the rain gutter, the antenna mount need only support a ¼ λ antenna. The electrical diagram of such an

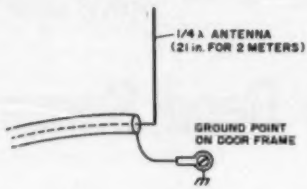

Fig. 2. Electricial diagram of gutter mount ¼λ antenna.

antenna mounting is shown in Fig. 2. The advantage to such a mounting scheme is that the antenna needs to be only ¼ λ long and, therefore, can be made to be quite sturdy mechanically. Also, since the ground point is fixed, the antenna can be removed or placed on the rain gutter at the *same* point as often as desired without any effect upon the transmission line SWR. There is no series capacitor or other tuning reactance needed at the base of the antenna and the mechanical construction of the antenna mount is greatly simplified.

The key to taking advantage of this antenna mounting scheme is to find a point on the rain gutter of a car to which a transmission line can be run and a good ground connection made for the shield of the coaxial transmission line just before the cable reaches the rain gutter. The requirement sounds more difficult than it really is in practice. If one examines the moulding around the doors on most American cars, there will be found to be a number of points where one can secure a good ground connection and run a coaxial cable inconspicuously to a good mounting location for a transceiver or power amplifier. Fig. 5, shows how I mounted a ¼ λ antenna on the rain gutter (forward passenger side) of a standard Pontiac sedan. The coaxial transmission cable was brought from a 2m power amplifier (mounted behind the glove compartment) underneath the forward side window frame moulding (easily removable by two screws) to the space between the door and the door frame of the car body. There were several screws used to secure flashing to the door frame of the car body where the coaxial cable emerged at the top of the door. One screw mounting nearest the top of the door was used to ground the shield of the coaxial cable via a ground lug after the screw and the hole in which it sat were cleaned with a file to insure a good metal to metal ground connection. These types of screw mountings can be found around the door frames of any car although the location will vary with car makes and models.

Once the shield of the coaxial cable was grounded about a 7.62cm length of the inner conductor (with insulation) was left to connect to the antenna when it was temporarily attached to the rain gutter. When the antenna was removed from the rain gutter, the 7.62cm length of inner conductor was just run along the inside upper edge of the door frame and remained completely inconspicuous. The 7.62cm length of unshielded cable does become part of the radiating portion of the antenna but this effect is minor on the VHF and lower UHF bands.

Mechanical Details

A rain gutter mount can either be purchased or easily homemade. If one can obtain spare parts for a car top luggage carrier which utilizes a support connection to the rain gutter, one need only purchase such a single accessory support and turn it into an antenna mount. The form of such a mount is the same as that of the homemade support to be described which, in fact, was

copied from a commercial luggage rack support.

The homemade support can be easily constructed from hand tools and is made of .32cm or .48cm thick aluminum stock. It consists of two pieces – a T shaped main support and a clasp which goes around the rain gutter. The dimensions for these two

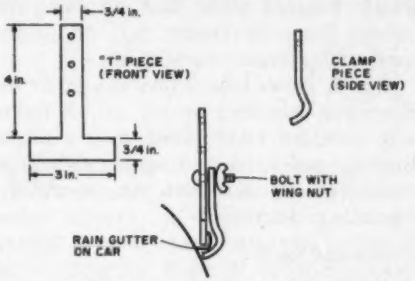

Fig. 3. Rain gutter mount showing "T" piece, clamp piece and assembly of two pieces together on rain gutter. All holes are ¼".

pieces plus how they assemble together to mount on the rain gutter are shown in Fig. 3. The two pieces are held together and tightened to the rain gutter via a bolt passing through both pieces and a wing nut. This arrangement provides a tight mount as well as one which is readily removable without any tools. The dimensions of the two pieces are not important. The dimensions suggested will provide more than adequate support for a 2m antenna but can be made even smaller if desired. The T shaped piece can be easily cut out of flat aluminum stock with a hand saw. The clasp piece is best formed by using a hammer and a wooden dowel to form the clasp so it fits over the rain gutter of any specific car. To prevent marring of the car's surface, the lower part of the T shaped piece and the clasp should be covered with electrical tape or a surface covering of epoxy.

Antenna Placement on Mount

After having gone through the above work, I thought it would be a simple matter to mount the vertical antenna radiator in-line on the long vertical portion of the T piece by means of two insulated power supply type screw terminal posts. The inner conductor of the coaxial line could then be easily connected to the lower one of the two insulated screw posts. This scheme was tried using teflon insulators on the terminal posts and a variety of vertical radiator elements ranging from a flat radiator the same size as the vertical section of the T section of the

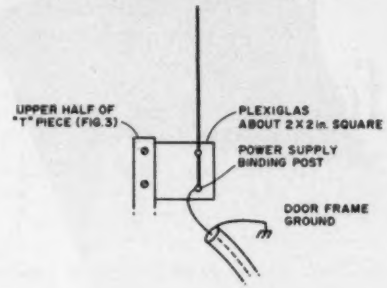

Fig. 4. Use of a plexiglass piece to isolate antenna from reactive effects of rain gutter mount.

mount to a thin diameter whip type radiator. To make a long, painful story short, it was not possible to secure less than about a 2.5 to 1 SWR on the transmission line to the antenna no matter how much any vertical radiator was shortened or lengthened beyond ¼ λ. A reasonable SWR could only be secured if some reactance were introduced between the transmission line and the antenna. This clearly indicated that the probable capacitive reactance between the base of the radiator and the mount was the cause of the problem. To test this idea, the vertical radiator mounting was offset from the rain gutter mount by means of a plexiglas separator as shown in Fig. 4. A telescoping whip was used as the vertical radiator. After a few minutes of experimen-

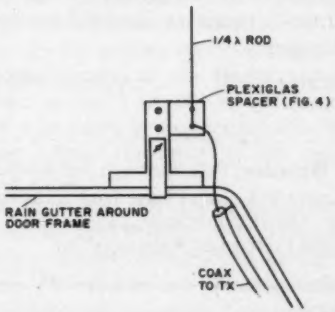

Fig. 5. Usage of the mount shown in Fig. 3. on the rain gutter of the front right door frame of a car.

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tation, it was apparent that the solution to the problem had been found. The length of the whip could be adjusted, using a SWR meter in the transmission line, to produce a perfect 1 to 1 SWR.

Perhaps the same effect could have been obtained by simply separating the vertical radiator element from the mounting by a greater distance rather than offsetting the radiator from the mount. But, the former appeared far simpler mechanically.

Fig. 5, shows how a final version of the antenna is mounted on my car. A rather large threaded knob rather than a simple butterfly nut is used to tighten the gutter mount bolt but aside from this, the antenna is exactly as described.

Results and Ideas

The antenna works almost as fine as a ¼ λ whip mounted directly in the center of the roof of the car. Some directional effects are noticeable because of the mounting position but for all general purposes they are minor unless one is at the absolute fringe area of a repeater's coverage. Other considerations in a mobile environment once full receiver quieting is not achieved usually will overshadow the 1-3dB advantage achieved by having the antenna mounted in the center of the roof rather than on the side of the roof.

Checks with a SWR meter showed that as long as the radiator element length is left unchanged, the antenna could be repeatedly mounted on approximately the same position on the rain gutter without effecting the SWR. The relatively easy to construct rain gutter mount described may be of interest if one would like to mount two or more vertical radiators on a car and phase them via delay lines in the transmission lines to each radiator to form an electrically steerable radiation pattern. Although perhaps not too useful for normal mobile operation, such capability would be of definite advantage for a mobile station operating over one of the Oscar satellites. This mode of operation will be described by me in a future article concerning simple, electrically steerable antennas for both mobile and fixed station operation over our amateur satellites.

. . . 73 Staff

George Hinds WB8JYR
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Westlake OH 44145

"TWO-METER TYPES YOU HAVE MET"

With scanner lights blinking and speakers alive with simplex and repeater activity on 2m FM one recent evening, I found myself classifying several of the amateurs in back of those far away voices by their personal operating methods. Surely you, too, have met them from time to time, for they are not by any means peculiar only to my locale.

For example, just a few minutes ago I listened to "Old Joe Toe-Stepper." Verily, Joe has "the fastest thumb in the midwest!" Never yet has he allowed a second of silence to elapse between transmissions when in QSO; no "breaker" is going to get in on Joe at any cost (even though it may be an emergency involving life and limb).

And here is "Billy the Breaker" again! Just when an interesting QSO is underway and listening is both enjoyable and informative, Billy "breaks." More often than not, he succeeds in breaking one's train of thought, the interest of the listening stations and finally the QSO, since his contribution is limited to "Ah's" "Oh's" "I don't know" and "Am I getting out?"

Everyone on the local repeater has met "Carl Clockwatcher" and caught him in his first contact with someone new on the repeater. Someone told Carl that the machine has a three-minute timer to limit emissions and, by golly, Carl wants his share of that air time. With fixed stare at the clock on the wall of his shack, he mumbles into the microphone for two minutes and fifty-nine seconds with each transmission, despite the fact he has nothing really to say. However, I have noticed lately that Carl is more and more often calling on the repeater without raising a response; even the newest newcomers soon learn to avoid that boring trap from which it is so difficult to escape gracefully.

A few nights ago I listened to "Sid Screamer." You know Sid – he's the fellow who believes unshakably that yelling into the mike will carry his signal louder and clearer than anyone else on the machine (even though his excessive deviation just took him out of the repeater receiver). Oh, you know Sid?

Does everyone have a ham in the area like "Henry the Hardheard?" You can often hear him complaining at hamfests about his always brilliant QSO's being clobbered by some nasty repeater that is deliberately "out to get him." I heard him this summer crying that all too often the local repeater would be activated deliberately to interfere with a QSO of his. The truth of the issue was found to be that old Hank insisted on working simplex on the repeater output frequency right under the umbrella of the machine and the "interfering" stations were mobiles away out in the far reaches who could not know of the QSO going on. No, Hank insists he'll continue to use "simple" 94 (or 88 or 16 too) for he won't be regimented away from his pet simplex frequency by any repeater council plans.

All too numerous among the ranks of hamdom is "Pete Plunker." Pete's two-meter operation consists of switching his rig from repeater to repeater and plunking each one successively and repeatedly to reassure himself that all the area machines are operational. Of course devotion to this self-imposed duty requires that he perform his plunking

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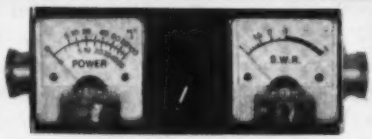

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secretively and with a high degree of regularity so as to elicit yelps of frustration and despair from the monitor stations on the frequency. No, Pete obviously doesn't identify himself nor pay dues to any of the repeater groups. He rationalizes his activity by saying that he doesn't use repeaters (he just tests them!). However, he does spur the technicians responsible for the machine to greater activity; at last report they were working on a guard system for the repeater to curtail Pete's perverted enjoyment of two-meter FM (and sorrowfully thus deprive some transient mobiles from having a repeater available).

And then there's the sorriest specimen of all, the local "Mystery Ham" who has obtained the access touch-tone code for the various repeater phone patches and spends his days and nights indiscriminately opening phone patches without identifying or even dialing up a number. He just lets the patch hang until the timer takes it out or a monitoring station shuts it down! There are some who say it can't be a ham doing this but instead is someone of questionable (and unprintable) ancestry who delights in destroying the good work of others. Whatever or whomever it is, dire threats of "reverse-type" antenna parties (or worse) are directed toward him and direction-finding is the project in many minds.

Despite these few drawbacks, 2m FM is now becoming the fastest-growing segment of amateur radio. The specimens identified above are vastly outnumbered by good amateurs who make the band a really fine place to hang out. Countless stations are on frequency, not just for local ragchewing, but to offer a friendly voice and helpful directions to all who pass through our area. One has but to complete a lengthy trip with the companionship of a good 2 meter rig to notice the miles of boredom have been turned into smiles of friendship. On freeways or through barren back roads, a contact with a fellow ham is generally available, so the day (or night) is made shorter and "highway hypnosis" is dispelled. Try it. Thousands of fellow hams know you'll like it!

. . .WB8JYR

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Pete Walton VE3FEZ
421 Lodor Street
Ancaster, Ontario
Canada

HOW TO WIN FRIENDS AND INFLUENCE THE 2-M MAN

The other night I walked into the club shack, and there it was, a new rig. It was about 12 inches long, 8 inches deep and about 4 inches high. On the front were two rows of eight lights and eighteen pushbuttons. It also had an on and off switch, volume control and squelch. Hmm, looks like two meter FM with automatic scanning. I should explain that I am a 20m phone man and never used FM gear before. Maybe I should see what this FM business is all about.

Power on. That was easy. One of the sixteen lights even came on, the first one in the top row. That must mean that we are on the first channel. Nothing to this FM business. Wonder why it won't scan? Push all the buttons in – still won't scan. Pull all the buttons out again – still no scan. This looks like a problem. Try all the buttons one at a time; still no luck. Now there is only one control that I have not moved. Advance the squelch control to get rid of that awful noise. Ah ha! It starts to scan all eight lights. Seems that this scanning feature locks up even on noise; good idea. Looks just like Christmas now, scanning all eight lights over and over again. Still haven't heard anybody yet. Let's try a CQ and see if it works. Pushed the channel one transmit button and the rig stopped scanning with the channel one transmit light on. This all seems very normal, even to a twenty meter phone man.

Well, here goes. C.Q. C.Q. C.Q. C.Q. Two meters. Got an answer right away. I was told in no uncertain terms that you don't call C.Q. on two meter FM especially through a repeater. Okay, I explained that I was new on two meters and didn't know all these things yet. The fellow was really very nice about it and explained all sorts of things about FM.

Then he said, "Let's go to 94." Oh, oh, no 94 on this rig, only 1 to .8, but he explained this also. Pushed in channel 4 and sure enough there he was. We had a really enjoyable QSO on 94 – no QRM, no QSB, and it was very informative.

He did, however, forget to remind me of one very important little matter which I will discuss next. After we signed off, the rig started scanning again. It stopped scanning on channel 3 and somebody asked if there was anyone on frequency. I answered and explained that this was only my second QSO on two meters. The fellow was very nice and volunteered all kinds of information about two meter operation. I told him all about the fun I was having on two meters and then went on to completely describe our club station. Told him about my own station. I then made some comments about how much better the lower bands were. "Okay, back to you, old man," . . . hmmm, nobody there! Now I began to remember what the other fellow had forgotten to remind me about. It seems these repeater stations have some type of time-out device. Forgot about that . . . I listened to the other channels for a minute and heard a fellow say he was on his way out to the repeater and he was suggesting the possibility that I may be of doubtful parentage. Oh well, back to twenty meters. I can stay out of trouble down there.

. . . VE3FEZ

Cecil Phelps K4HHI
P.O. Box 154
Delco NC 28436

Complete MOTOROLA METERING Plus !

If you need complete metering, monitoring, and control for alignment or routine service of Motorola FM units, this article should be of interest. This unit is fairly simple to build, has all the metering available in the popular Motorola P8501 Test Set, and new parts cost should run under $30.00, much less with an average goodie box.

In addition to the 8 position transmitter and receiver monitoring, it has the following: 1 field strength meter with gain control; 2 speaker and volume control; 3 four pin mike jack; 4 PTT hold switch; 5 3V dc jack (GE Progress Line etc.); 6 tone input jack.

Parts layout is not critical, so each individual can come up with whatever suits him best. Most parts are stocked at local supply houses, balance available through any of the popular mail order catalogs. Mine was built on a 9" x 7" x 2" chassis.

When the wiring is completed, the usual visual checks should be made for loose solder, cold joints, wires or pins shorted, etc.

OPERATION

Note: field strength, plate current, and 3 VDC switches stay in the normal-off position, unless in use. The transmitter-receiver switch should be placed in correct position before plugging into respective unit.

Field Strength – use small antenna or test load for rf pickup. Key transmitter and adjust sensitivity.

Polarity – change position any time meter reads backwards.

3 volts dc –,use for GE Progress Line, TPL, etc.

Plate Check Only – meters plate current in P.A. regardless of 8 position switch.

Transmitter Key – holds transmitter on for alignment, etc.

Mike Jack – for using mike in trunk, etc.

Tone-In Jack – for inserting audio for adjusting modulation.

Position #	Average Reading	Receiver
1-	-1.5	2nd if G1
2-	-18/40	1st LIM G1
3-	-25/35	2nd LIM G1
4-	Zero	Disc. Secondary
5-	-12/16	Disc. Primary
6-	-12/40	Osc. G1
7-	+10	B+ 200V
8-	+10/20	Audio Out
	Average Reading	Transmitter
1-	None	Blank
2-	None	Blank
3-	-13	Tripler G1
4-	-10	2nd Doubler G1
5-	-16	Dou-Driver G1
6-	-15	P.A. G1
7-	*+17)HV=reading x 20)*	B++ 340V
8-	*+40 (AV=15V FS)*	A+ unkeyed

Table 1. Average readings for 80D series, transmitter and receiver.

GATEWAY ELECTRONICS

8123-25 PAGE BOULEVARD
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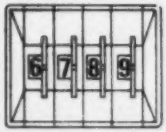
THUMBWHEEL SWITCHES

STANDARD SIZE - 0.5 x 2.125 x 1.78

10 position decimal	$3.00
10 position BCD & compl.	$4.00
End Plates (per pair)	$1.45

MINIATURE SIZE - 0.312 x 1.3 x 1.3

10 position decimal	$2.50
10 pos. BCD & comp.	$4.00
10 pos. BCD only	$2.75
End Plates (per pair)	$1.00
Divider Plates	$1.25
Blank Body	$ .30



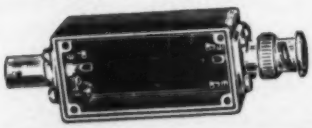
All switches are black with white figures and snap-in front mounting.

TRIAC CONTROLLER – Triac adjustable light dimmer rated at 1200 watts – 0-115 volt. Ship. wt. 2 lbs. **$3.50**

2" SCOPE TUBE SHIELD – Manf. by Millen. Ship. wt. 1 lb. **$3.95**

PAMONA BOX – 2 1/4 x 1 1/8 x 7/8 Miniature box w/BNC plug & jack – good for attenuators & other small projects. Ship. wt. 1/2 lb. **$3.95**

BNC JACK TO BNC PLUG



MINIATURE SWITCHES – DPDT Miniature Push-button switch **$1.50**

MINIATURE SWITCHES – SP6T Enclosed Miniature rotary SW. ½" dia. **$1.50**

EQUIPMENT COOLING FAN – 115V AC – 3" diameter – w/mounting bracket – 3 lbs. **$3.50**

$5 Minimum Order. Visit us when in St. Louis. Please include sufficient postage.

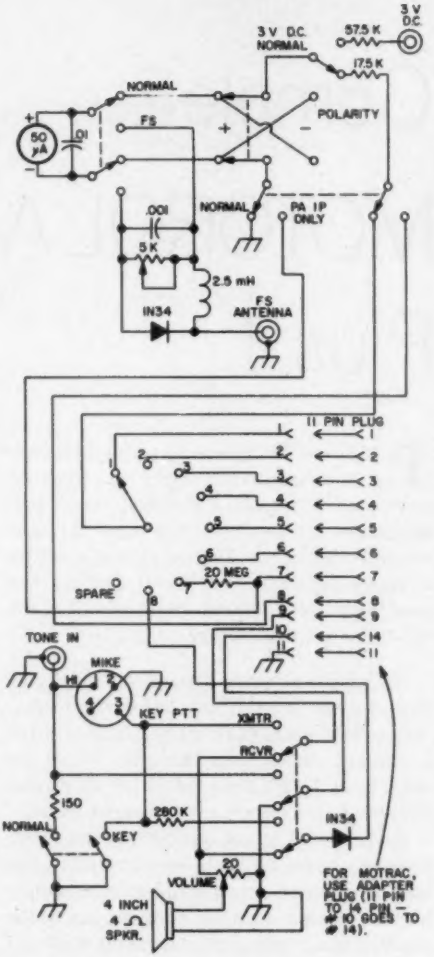


Fig. 1. For Motrac, use adapter plug (11 pin to 14 pin – #10 goes to #14).

8 Position Switch – for transmitter and receiver stages. See Table 1 for 80D series. (Most are alike, but consult manual for exact specs).

PARTS LIST

Meter – 50 μA (2500Ω)
11 pin plug – Amphenol 86GP11
4 pin jack – Amphenol PC4F
Switch (9 pos.) – 9 position rotary, 1 pole
Switch (Xmtr-Rcvr) – 2 position rotary, 3 pole..

.:.K4HHI

Frank J. Miller K6QFO
R.A.C.E S. Club
Country Government Center
Redwood City CA 94063

AM Or FM INPUTS

(on the same frequency)

Most modern repeaters have gone to FM input and FM output. Of the few AM repeaters left in existence most are connected with Civil Defense or RACES groups. Just try and get the cities and counties to buy new or used FM equipment all at one time when they still have good operating equipment. It's impossible.

An AM input to FM output machine was put into service in San Mateo County to connect the coast to the main peninsula. There is a range of mountains running the length of San Mateo County and almost down the center. Using simplex AM units, communications were almost impossible from the coast to the peninsula. With the repeater, solid communication to and from the coast was possible.

In the beginning most of the stations were AM into the repeater. As the Civil Defense group got used to the machine more and more wanted to try FM. Try putting an FM signal through an AM receiver. The first plan was to use another input frequency, but due to the limited Civil Defense approved frequencies the same input had to be used for AM and FM.

Upon experimenting it was found that an FM and AM receiver could be tied together with an antenna splitter (with preamp built in) and worked like a dream. The preamp was used to cut down the losses when connecting the two receivers together. Audio output from both receivers is tied together through small solid state amps. The keying of the repeaters with an FM receiver usually used a carrier operated relay (COR), which worked fine on an FM signal, but when an AM station came on the COR chattered or refused to work. Finally a voice operated relay (VOR) was used on the composite audio and worked fine.

We now have quite a growing group using anything from Twoers to Motorola bricks, this really brings out the old equipment and an incentive to go on FM. Some day we will remove the AM receiver, but during a disaster every piece of equipment can be used on the AM or FM input. Try it, it really works.

. . .K6QFO

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- Direct frequency readout to 100Hz.
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- Reliable, plug-in, modular circuitry.
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- 240 Watts PEP.
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Williamstown MA 01267

ANOTHER LOOK AT VERTICAL WATERPIPE ANTENNAS FOR TWO METER FM

There have been numerous articles written on this subject in the past; yet the fact that confusion abounds is confirmed by talking to groups who have tried to build these devices.

At the present time the Northern Berkshire Amateur Radio Club (K1FFK 146.31–91) (WA1KFZ 146.10–70) (K1FFK 52.76–52.66) has 6 of these in operation – three 20 footers, two 30 footers, and one 40 footer. These antennas have proven themselves perfect for amateur repeater use.

The ideas presented here were developed by K2CBA, K1DEU, and myself while constructing and checking out the club's antennas.

The antenna is a multiple of 1/2 wave elements with 1/4 wave sections on each end and a 1/4 wave conductor which acts as a stub to reduce feedline radiation. See Fig. 1.

Construction of the antenna proceeds as follows:

1. From the formula $\lambda/2 = 492/F(Hz)$ calculate the half wave length in air for 146.00. This comes out to 3.4 FT or 40.8 inches.

2. Select the coax you wish to use and obtain information on the velocity factor of the coax. Generally solid dielectric coax has a velocity factor of approximately .66 while foam dielectric velocity factor is approximately .8. I would recommend the solid because of its better heat resistant qualities and it makes a smaller antenna. For solid coax 1/2 wavelength is approximately 26.90 inches. In general, the velocity factor varies by as much as γ5% from manufacturer to manufacturer. Measurements with a pulse generator and Tektroniks 585 confirmed that there was enough variation that some sort of procedure for taking this into account must be developed.

3. To proceed with the fabrication, two pieces of equipment are needed – a signal generator (low power transmitter) covering the range desired (140–150 MHz) and an SWR bridge. With these in hand, fabricate a 3 element section (three 1/2 wave elements including the 1/4 wave top element (13.5") and radiator 19.25" and the bottom 1/4 wave stub. With this completed, hang the antenna equidistant from the floor and ceiling and measure the resonant frequency. If this is not within γ1 Hz of your desired frequency open the antenna and trim the 1/2 wave elements until you are within that

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BAND	STAGES	GAIN	NOISE FIGURE	KIT PRICE	WIRED PRICE
10 meter	Single	25 dB	2 dB	$15.50	$18.50
6 meter	Single	25 dB	2 dB	$15.50	$18.50
2 meter	Single	20 dB	2.5 dB	$15.50	$18.50
2 meter	Double	40 dB	2.5 dB	$30.50	$36.50
220 MHz	Single	17 dB	2.5 dB	$15.50	$18.50
220 MHz	Double	35 dB	2.5 dB	$30.50	$36.50

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range. Do not worry about the actual VSWR; look only for the VSWR minimum.

4. Depending on whether you are slightly high or low compared to your design frequency, alter another pair of 1/2 wave elements cutting them 1/4–1/2" longer if you are too high and 1/4–1/2" shorter if you are too low. Solder these into the antenna and check again. Continue this operation adding pairs of elements and checking until you have reached the mechanical length you desire. The antenna can be any length you feel is mechanically supportable. If possible, try to stay a little on the high side of your design frequency.

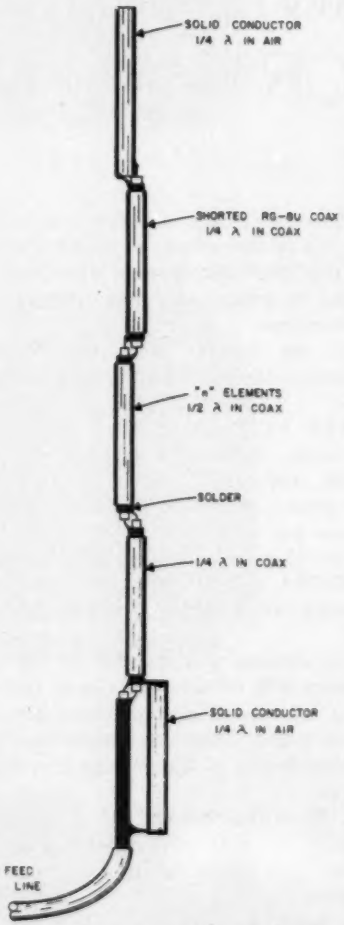

Fig. 1. Antenna construction.

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Please specify ☐ Assembled ☐ Kit ☐ Options _____
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Name _____ Address _____ Call Sign _____

City/State/Zip _____

Illinois residents add 5% sales tax. L

5. When you have reached your desired length, stop adding sections and run a test by powering the antenna from a transmitter and running a wave meter (absorption) up and down it, each element should be radiating equally if you have no shorts or opens.

6. Now tape each junction completely with 3–4 layers of good electrical tape. This gives mechanical integrity and some sealing to the connection.

7. Again check for the minimum VSWR point. Hopefully you have come out a little (250–500 kHz) high of your design frequency. With the antenna draped in the air again, take some 1" wide strips of aluminum foil and hang over the taped electrical connections. Play with these strips, removing, adding, etc., until the minimum VSWR point is exactly on design frequency and the VSWR is also minimum. It is a two-man job at this point.

8. When you have the thing "right on," tape over the foil permanently holding it in place.

9. If you have built a 25–40 footer, your VSWR should come out to better than 1.1 to 1 and hopefully 1.0 to 1. If you have built an antenna less than 25 feet, your VSWR may be as great as 2.0 to 1. This is because the impedance of the bottom 1/4 wave element is not correct (I think). This can be compensated for by the addition of a matching stub (solid conductor) in parallel with the feed line quarter wave stub. Vary the point of soldering this to the feed line for minimum VSWR – using this technique, the VSWR can be brought under 1.2 to 1.

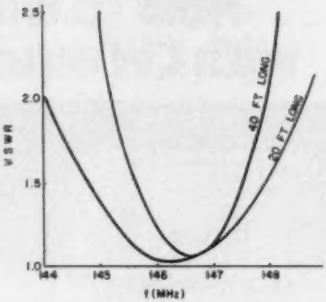


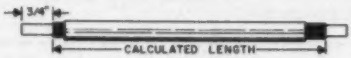
Fig. 3. VSWR plots on 2 antennas.

1) Cut to desired length + 2.0"

R6/8U Solid Dielectric

2) Cut insulation back 1" each end flux and tin each end.

3) Using tubing cutter, cut shield off 3/4" from first end, measure final dimension (from calculations) from shield on cut end to other end, mark, and cut shield with tubing cutter.



4) Using single edge razor trim insulation leaving 1/16–1/8" remaining.

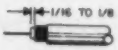


Fig. 2. Method of element preparation.

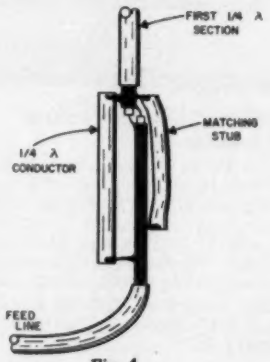


Fig. 4.

10. Now pick up some 1-¾ 2" OD PVC pipe and fittings and build a housing for your new creation. The 20 foot unit should show six dB gain while the 40 foot should have 9 dB gain omnidirectional, of course. The longer antenna will have a flatter pancake coverage pattern (vertical plane); and, of course, its VSWR plot will be sharper.

Good luck! Hope this has helped.

. . .WA1KJI

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MOTOROLA MODEL NUMBERS

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T43CMT-1130A

1st character (T) (Housing)
- B = Base
- D = Dash mount
- H = Portable (max. portability)
- M = Monitor rec.
- P = Portable
- R = Railroad
- T = Trunk mount
- U = Universal Mount

2nd character (4) (RF out)
- 0 = Rec. only
- 1 = less than .75W
- 2 = .75 – 3.9W
- 3 = 4 – 15W
- 4 = 16 – 40W
- 5 = 41 – 69W
- 5 = 70 – 100W
- 7 = 101 – 134W

3rd character (3) (Freq.)
- 0 = Below 25 MHz
- 1 = 25 – 54 MHz
- 2 = 72 – 76 MHz
- 3 = 144 – 174 MHz
- 4 = 450 – 470 MHz

4th character (C) (Rec)
- A = Sensicon "A"
- B = Unified chassis (450M)
- C = Mocom
- D = Portable
- G = Sensicon"G"
- H = Motrac
- L = Motran

5th character (M) (Xmtr)
- A = 30–60W "A" transmitter
- B = Unified chassis (450)
- C = Lo + UHF portable
- E = High band portable
- G = Mobile +AC utility "G" xmtr
- H = Motrac
- L = Motran
- M = Dispatcher

6th character (T) (Power)
- B = 117V.AC
- C = Battery (dry)
- D = Dynomotor
- M = Transistorizes w/ int. bat
- N = No power supply
- T = Fully transistorized
- V = Vibrator

7th character (1) (Squelch)
- 1 = Carrier
- 3 = Dual (PL)

8th character (1) (Chan. Sp)
- 0 = Wide band
- 1 = Split channel

9th character (3) (# of freqs)
- 0 = 1 trans & rec
- 3 = 2 trans & rec
- 7 = 3 trans & rec

10th character (0) (Power)
- 0 = 12 volts
- 1 = 6/12 volts
- 4 = 6 volts

In the example at the top of the page, T43CMT-1130, this would be a trunk mount, power between 16 & 40 watts, between 144 & 174 MHz, Mocom receiver, Dispatcher transmitter, fully transistorized power supply, carrier squelch, narrow (split) band, 2 freq using 12 volts. This may help those who are new at the game of trying to figure out what a mobile unit really is.

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Penetanguishene, Ontario
Canada

ADJUSTING FM DEVIATION

Proper adjustment of the deviation control is important for good FM communications. If it's too low, the audio at the receiver is also low. If it's too high, you may be over-deviating and getting signal reports that – though your signal is strong – break up when you talk.

Test instruments for measuring transmitter deviation cost upwards of $250. There is, however, a shortcut method of deviation measurement using an FM receiver and an ac voltmeter (or oscilloscope).

To adjust deviation using this method, you must use a receiver of the appropriate bandwidth. Economy price monitor receivers of undertermined bandwidth are of no use here.

If you want to use a narrow band ±5 kHz system, you must use a receiver with ±5 kHz bandwidth. If your system contains both wide and narrow band units, adjust all transmitters for narrow band operation. This will cause slightly reduced audio in the wide band receivers, but will provide much better overall performance. Most commercial units: Motorola, GE, etc., have power supplies which will allow the transmitter and receiver to be used simultaneously for short periods of time. Refer to the schematic for your particular rig to see how this can be accomplished, as you can then check your transmitter deviation using the associated receiver as a monitor.

The hookup for measuring is as follows: Connect an ac voltmeter or scope across the speaker terminals. Apply a 1 kHz tone to the transmitter. If an audio oscillator is not available a constant whistle of about the same frequency into the mike will do. With the deviation control at the lowest position (CCW) key the transmitter and slowly advance the control while watching the ac meter. If feedback occurs, or if you can't stand the noise, substitute a 5W resistor of the right value for the speaker.

As you increase the transmitter deviation you'll see a fairly linear increase in the receiver audio level, followed by a flattening out, and then, as you go outside the passband of the receiver, the audio level will fall off and the noise level will increase. This is an excellent example of what happens when an over-deviated signal is received by another FM mobile.

Repeat the control adjustment several times, paying particular attention to the point at which the linear rise just starts to flatten. This is the point at which the deviation control is properly set.

I've used this method to set deviation on many, many occasions and have been amazed at its accuracy when compared against properly calibrated instruments.

. . .VE3FGS

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7409	.25	7476	.47	74174	1.85	CD4025	.60
7410	.23	7480	.50	74175	1.85	CD4027	1.25
7411	.30	7482	1.75	74176	.85	CD4030	.60
7413	.89	7483	1.15	74177	.85	74C00	.65
7416	.45	7485	1.10	74180	1.05	74C04	.70
7417	.45	7486	.47	74181	3.75	74C20	.65
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7427	.32	7494	.97	74192	1.50	8094	.55
7429	.40	7495	.95	74193	1.50	8095	.55
7430	.33	7496	.95	74194	1.50	8096	.55
7432	.26	74100	1.50	74195	1.05	8097	.55
7437	.45	74107	.47	74196	1.25	8098	.55
7438	.50	74121	.55	74197	1.05	8121	.90
7439	.50	74122	.47	74198	2.25	8123	1.60
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New South Wales, Australia

A 146 MHz MOBILE ANTENNA

Here is a very inexpensive antenna which uses your car body as the ground.

In Australia, mobile operation on 146 MHz FM, using discarded mobile radiotelephones, is very popular. As with all amateurs the author has given considerable thought to getting the most signal out with a minimum outlay. The units available restricted the actual power available, without major modifications, so the next important link in communications, the antenna, received my attention.

The most used antenna is the quarter-wave whip. This antenna leaves a great deal to be desired especially if it is mounted on the mudguard where shielding reduces its effectiveness. After all, not all of us like to carve holes in the center of the roof. An antenna which has some appeal is the coaxial dipole, an efficient radiator, which could be elevated above the car roof to minimize shielding. However, this antenna has problems with feed lines in its standard form. Below is the story of how these difficulties were overcome to produce a gain antenna utilizing a cheap base connector.

The normal coaxial dipole consists of a quarter-wave whip on top of a metallic supporting pole which is metallically and electrically joined to a quarter-wave sleeve. The coaxial cable inner is connected to the bottom of the whip and the braid to the pole and the sleeve. This system produces a strong ground wave but also produces standing waves on the supporting pole. By placing radials a quarter-wave below the bottom of the sleeve they act as an rf choke to reduce the standing waves on the pole. A secondary effect of these radials is to utilize the standing waves to reinforce the original radiated signal. Thus the radials add to the gain of the antenna.

If such an antenna could be used with the car body acting as the ground plane we would achieve a very efficient mobile radiator. The feed impedance of a coaxial dipole antenna is a nominal 75Ω and normally it would be necessary to feed the coaxial cable up the center of the supporting pole to the feed point. This necessity would make the antenna a rather messy one to attach to a car. On studying the suggested antenna it was realized that the distance from the ground plane to the feed point is approximately a half wavelength.

One fact emerges from this discovery. Because impedances are repeated each half wavelength on a transmission line it is

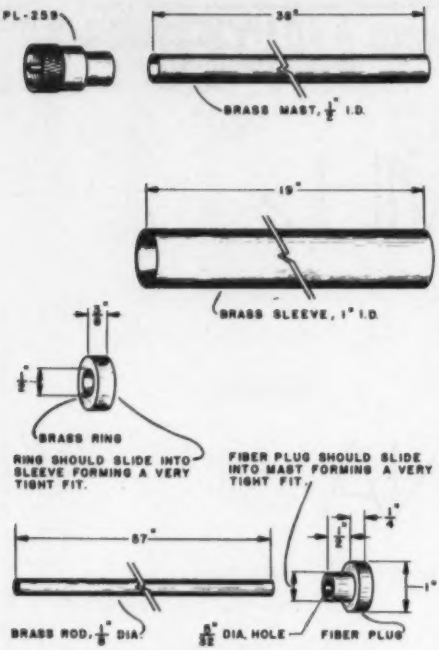

Fig. 1. Sub-assemblies for 146 MHz coaxial dipole. Items shown are not drawn to scale and most critical dimensions have been left out.

possible that a feed point impedance at the ground plane could be repeated in impedance at the junction of the whip and sleeve. However, because of velocity factor effects on transmission lines, it would be impossible to use ordinary coaxial cable for this purpose. The transmission line must have a velocity factor close to unity.

A transmission line with a velocity factor of unity is air spaced coaxial cable. By now the reasoning may have become clear to the more astute. The support pole can become the sheath of an air spaced coaxial cable so that a wire fed centrally through its half wavelength will produce the required unity velocity factor half wavelength transmission line. The impedance of this line is not critical as it will repeat the impedance seen at one end to the other. This means that the materials used can be governed by the fittings and facilities of your own workshop.

In practice the inner conductor will need the support of two or three beads along its length. These could be pieces of poly from coaxial cable. This will tend to reduce the velocity factor very slightly. The bottom section of the antenna due to end effect is slightly less than a half wavelength. You will find that these two factors just mentioned tend to cancel each other out.

There are many ways of fabricating the antenna and one suggested method is shown in the accompanying sketches. For economy the PL239 plug assembly was chosen for a base connector. The half wavelength supporting tube is brazed or soft soldered to the tailpiece of the connector. Incidentally, pick a connector with an insulation material that is not susceptible to heat. Also note that the bottom section length should make due allowance for the length of the connector used. A brass spacer ring is brazed or soft soldered to the top of the support pole. This brass ring is drilled and tapped at three or four points to allow the brass sleeve to be screwed into position.

The inner conductor and whip is made from one piece of material. One end of this material is reduced to fit into the inner of the connector. Slip the support beads on the inner conductor, insert it into the support pole and solder the end to the connector. Next a small fiber, or similar material plug is fed over the whip end of the inner conductor and pushed to the top of the support pole. A generous application of an epoxy based glue at this point will complete the construction.

When installed the SWR may be shifted slightly by varying the length of the whip section. On the few antennas made by the author the whip length was deliberately made long, about 22 inches, and then reduced bit by bit till a minimum SWR was achieved.

In-operation tests were made by comparing against a standard quarter-wave whip, both mounted on the center of an automobile roof. In all tests, changing from the quarter-wave whip to the coaxial type antenna more than doubled the limiter current of the FM receiver used for signal strength comparisons. Some of these antennas with normal quarter wave radials have been used as home station antennas with excellent results.

...VK2BAU

Bill Hoisington K1CLL
c/o 73 Magazine Inc.
Peterborough NH 03458

Miniboxing the 1.65 MHz i-f

(432'er Series)

Here is a 1.65 MHz i-f strip, all built into a minibox, for use with VHF converters.

Why build something like this? Well, I made the unit to go with my 432'er transceiver, but it certainly will work with just about any HF or VHF converter to provide good selectivity and high i-f gain along with adequate image rejection. Besides that, how many good transistorized i-f strips are there around these days?

The two transistors in this amplifier give you all the gain you can ask for when used with a low frequency (135 kHz) i-f amplifier. This is where you really pick up your selectivity.

As usual for me I first built the unit on a breadboard where I could get at it and experiment with all of the components. There were enough headaches in getting this to work so I was glad that I hadn't started out cramming it all into a minibox. Once I had it working smoothly and had all the bugs out I did rebuild the finished project in a little box. Strange to say, it still worked!

Selectivity is important for two reaons: first, when used alone, and second, for avoiding images when used with the narrowband 135 kHz i-f. There are some natural frequencies for i-f use that, because of allocations, are better than others. 455 kHz is an important one, but mainly for broadcast receivers, because images can be troublesome at 28 to 30 MHz in amateur use.

The next one up is at 1.65 MHz, just outside the broadcast band, giving an image more than 3 MHz away from the desired signal. A number of low-cost receivers have used this i-f; however, the selectivity of these receivers has generally suffered when used on the crowded bands, or even on VHF openings.

So in this 1.65 i-f we have not put in crystal or ceramic or mechanical filters because of cost, but rely instead on the addition of the 2 x 4 in. minibox converter

and narrow band i-f to supply the selectivity needed. Needless to say at 135 kHz you can get almost any degree of narrow bandwidth you want to use on 432 and 1296 MHz, or any other VHF band.

Fortunately we have found an i-f transformer core design that makes homebrew winding at 1.65 MHz easy and still results in adequate selectivity. See Tables I and II.

Keep in mind that in a triple conversion receiver, as well as in a front end, image response is at times very important. If the 1.65 MHz i-f does not have sufficient selectivity the 135 kHz image only 270 kHz away could come through it. The three tuned circuits used, one of them being in the output of the 28 to 30 MHz tuneable converter, form a 1.65 MHz i-f that does the job in good style.

Gain design

As mentioned before, it is easy in the 432'er to actually suffer from an excess of gain unless proper controls are used. With two low-noise rf stages in front, a good 10 meter tuneable front end used for tuning and conversion at 28 to 30 MHz, two stages on 1.65 MHz, and then two more on 135 kHz, there is more gain than needed, if all are run full on.

Inasmuch as the experimenter builder may at times also want to use some of these units separately for various tests or operations, each of them should be subject to good control for use alone with full gain or in the complete triple conversion receiver of the 432'er. In the latter use adjustable gain to suit the individual operator's taste concerning interstation noise is needed. Two methods of gain control have been tested and they are shown in Fig. 1 and Fig. 2. They both work well, as you will find, and can serve to set the interstation noise. The one shown in Fig. 1 is the usual type with the control in the emitter of Q1. The method shown in Fig. 2 controls the base bias and gives slightly more avc action. It is really a matter of whether you have a 1K pot or one of 10 to 25K on hand.

I-f Transformer Primary Winding Tests

Having the circuit on the breadboard for the second time, the best windings for the 1.65 MHz i-f transformers were investigated, and this turned out to be very worthwhile, allowing good design control over the question of neutralization which now turns out to be unnecessary.

There are four main parameters in the i-f transformer to start with. First, the size of the wire, the number of turns, the value of the resonating capacitor, and then the number of turns on the secondary going to the following base.

We have avoided a tapped primary for the sake of simplicity, using fewer turns and a bigger capacitor to match the collector impedance. However, you can go too far in turns reduction. When we went to only 15 turns, which needed 1700 pF for resonance at 1.65 MHz, the gain was down a little.

The size of the wire showed up as more important. I can just hear i-f transformer people laughing plenty at some of these remarks, but do *they* give you all the real lowdown for homebrew winding?

I had been using No. 38 wire and then No. 34, and finally went up to No. 30 in size, just to see. I saw, all right. The Q came up to where the internal transistor feedback caused Q1 to oscillate when its base and collector windings were tuned to exactly 1.65 MHz. See also Table I on the influence of the number of turns of the base winding.

A good balance was finally reached, as shown in Table I. The number of turns is not critical, it's just that there is a region where everything, such as af, selectivity,

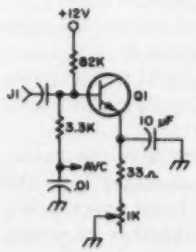

Fig. 1.

Emitter gain control.

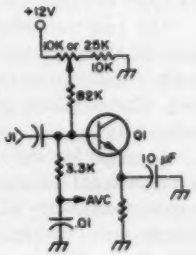

Fig. 2.

Base gain control.

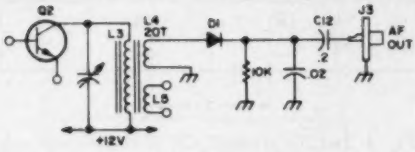

Fig. 3. Af circuits.

avc, no feedback, but still plenty of gain, are all at their best. You could get a little more gain with neutralization, but you don't *need* more gain.

Hope yours sounds as good when you build it.

The i-f transformer secondary windings were quite a revelation, even after building dozens of i-f transformers from 120 MHz to 135 kHz.

Here is the answer to feedback, oscillation, and neutralization. In the past I generally wound on a few turns, say five. For this secondary, L2, which feeds into the base of the next transistor, it worked, and I let it go at that. After all, there's plenty else to do in a complete low-noise, solid-state, high selectivity, triple conversion receiver on 432 MHz!

Having a second breadboard 1.65 MHz i-f running just to be sure of all the components going into the smallest minibox used here so far, I thought it might be a good thing to try a series of secondaries and see just what would happen. Lucky I did, as you will see. Referring to Fig. 8, the secondary winding L2 was varied with results as shown in Table I.

Table I tells the story. You *can* have both gain and absence of neutralization, if you just work at it a little.

"Boughten" I-f Transformers

The above tests on windings brings to mind right away a big question. Has the manufacturer put out his i-f transformer for an unneutralized stage or a neutralized one? I don't know! This whole subject is quite an important one and takes up the full time of various coil engineers around the country as well as the part time of a lot of device application engineers.

Once again the RCA Handbook on devices (I don't work for RCA. It's just a real good book!) is very explicit on the turns ratios of 455 kHz i-f transformers for transistors (but not the number of turns, unfortunately) in their application section on good low-cost receivers. Don't miss that section if you're going to build. I like especially their easy-to-do solution to overloading in a popular broadcast set.

Table I. Tests on L2.

Turns	Gain	Feedback
1	Not enough	None
2	Better	None
3	Almost enough	None
4	Best	None
5	Same	Regeneration shows
10	Same	Oscillates

Good Demodulation

This is something given considerable preference here because I *like* Admirable Modulation. It is possible to get to 432 with SSB, but look at all the converters you need! If they're low power you need a lot of amplification after you reach 432. If they're high power they cost like sin. And talk about touchy tuning. Wow!

So, more hours were spent getting good af out of diode D1, without overloading or blocking, on a loud local. This is also part

Table II. Winding data, I-f transformers.

Coil	Size Wire	No. of Turns	How Wound	In i-f xfmrs
L1	30, DSC	21	About 2 layers, progressive.	1
L2	34 DCC	4	On L1	1
L3	34 DCC	24	As L1	2
L4	38 DSC	20	Over L3	2
L5	38 DSC	2	Over L6	2
L6	38 DSC	15	Over L3	2

Notes. 1. Cup cores are from Miller 10C i-f transformers with all original wire and frames stripped off.
2. L5 has tape tabs for identification.
3. L6 has tape double tabs for identification.
4. Coils are wound on impregnated paper forms, 5/16 o.d., that slip over center post of cup core after winding.
5. Light application of High Q coil wax after each winding (melt on).

of the avc problem as outlined in the next section. Figure 3 shows the final af section, and it works well also. When the af diode was connected to the top of the collector winding L3, it seemed to produce a little distortion on loud signals, so a separate winding was installed in i-f transformer 2 and it really did the trick. Better tuning and selectivity and plenty of af and avc resulted.

From the way it works and sounds, this is liable to be my i-f output circuit from now on.

More and Better Avc

We really worked on this item also, and it paid off nicely. Remember, we're trying

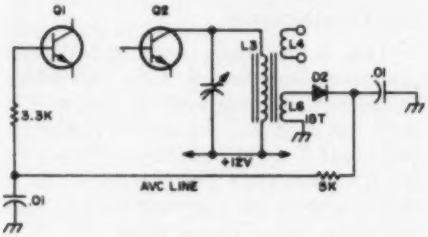

Fig. 4. Avc circuit.

to stick to a fairly straightforward circuit, just two diodes without a separate avc amplifier. Figure 4 shows details of the avc circuit that works like a charm. The trick of course is to be able to hear those stations in the next state (geographic) and still demodulate properly on a strong local without distortion.

Some like forward avc and some like reverse avc, and there are of course special reasons for both which need not concern us here. Reverse avc was always used with tubes, where the remote cutoff tubes were evolved just for that purpose. They were the opposite of steep slope jobs and used a variable grid winding inside the tube. Worked fine on loud locals. How about some transistors like that, RCA or Motorola? Maybe they already have them?

I go for reverse avc myself, because it just seems natural to cut down the current to lower the gain. Also maybe because most of the rigs I'm building have battery operation in mind.

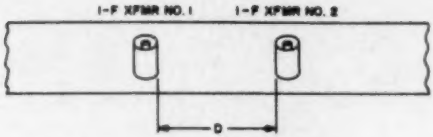

Fig. 5. Test for proximity of i-f transformer one to i-f transformer two.

In the circuit shown in Fig. 4, Q1 runs around 4 to 5 mils of current on no signal and drops down to 20 or 30 μA on locals. The dc balance for these conditions was worked out with a bunch of pots all over the place checking out the best values for R1, R2,R3, C1,C2, etc. The circuit calls for four windings on the last i-f transformer but is well worth it and not difficult.

I started with the af diode D1 connected to the L1 winding of Fig. 4, but soon found that better all-round operation resulted from a separate winding for the af which also made for better avc action.

Referring to Fig. 4, positive voltage goes to the base of Q1 through R1, is stabilized on "no signal" with resistor R2 and decoupling resistor R3, the whole line going to ground through D2. Negative voltage is developed when an i-f signal arrives at D2, and is sent through the avc line to the base of Q1, driving the current down to as low as 20 μA on a local.

Size Reduction

We're cutting down on the size a little with concentration on flatter packaging. A variety of real small size miniboxes, perhaps with adjustable partitions inside would be handy (Hey, BUD!).

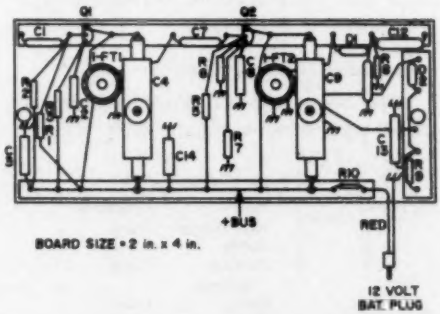

Fig. 6. Layout completed 1.65 MHz amplifier.

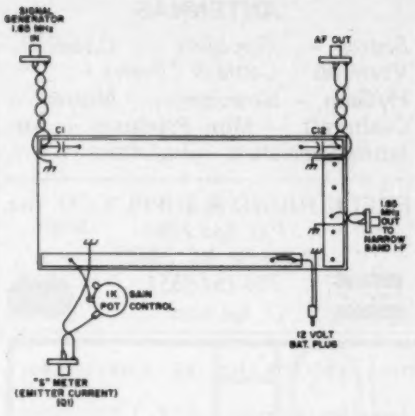

Fig. 7. Final test setup. 1.65 MHz i-f. All external components shown have to be unsoldered to install amplifier in box.

The gain control potentiometer is the biggest component here. However, Lafayette Radio comes through again on miniature components with their series at only 59¢ and only 5/8ths in. diameter.

The four jacks are of course single hole mounting types which take up a minimum of space inside.

My favorite .021 pins are used for terminals as usual, hammered into .020 holes drilled with a No. 76 drill through .035 fiberglass strips, with .005 fiberglass underneath to keep the pins from shorting to the baseboard, the whole cemented down with low-loss coil cement.

A test as in Fig. 5 was made to see how close to each other the i-f transformers could be placed with the following results: 2 in. okay; 1 in. okay; ½ in. beginning to show a little regeneration; 3/8 in. more regeneration; 1/8 in. oscillation from feedback. With the collector winding in L2 and the base winding in L1, this is an important consideration, especially for close packaging. In Fig. 5, the spacing is identified as "D." No trouble was had in this unit, as D equalled almost 1 in. Note that with magnetic coupling such as at 1/8 in. neutralization would be difficult if not impossible. An attempt was made to reduce the length of the box for this i-f unit, without success, because the two i-f transformers and the two trimmers are simply too big. However, 2 x 4 in. is certainly small enough for now.

Assembly and Layout

I generally have some sort of trouble to relate, but I guess the use of the second breadboard and checking of components was a good plan.

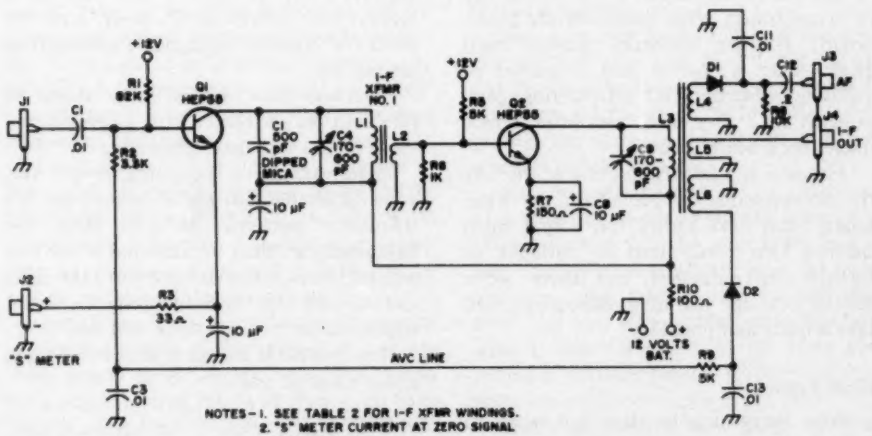

Fig. 8. Complete circuit 1.65 MHz i-f. Q1 and Q2 are Motorola HEP55.

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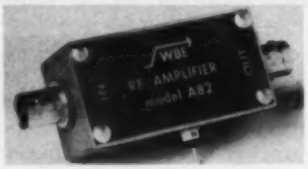

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(see QST Review, May 1973, pg. 41)

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The HEP55's with their base pin in the middle posed a small problem, but by twisting the leads around a little as you can see in the layout, Fig. 6, everything came out fine.

The key components such as diodes and i-f transformers were tested on the breadboard, so they naturally worked right away. This is mainly just a matter of avoiding soldering and unsoldering components in a very small area later, which makes for a neater final job.

Figure 6 is a faithful picture of the way the components are placed on the baseboard, and also shows the actual open spaces. This could lead to thought of further size reduction, but there we're getting near the use of a microscope, and that is quite another story.

Final Testing

With everything in place and ready to go, signal generator, af test amplifier, S meter, and battery plug connected, the "on" switch was ready to be thrown, as in Fig. 7. And this is just the time when I always get the jitters! Will the 0 to 100 milliammeter in series with the 12V battery slam over against the pin? Will Q1 and Q2 go West in a few milliseconds? Will a dull silence come out of the loudspeaker? However, the moment a few mils show steady, my nerves settle down and I'm good for hours of alignment, gain-setting, testing, etc.

This one came on right away, tuned up fine, and only needed a little jiggling of the value for R1 to behave perfectly.

After everything is running, proper avc, good adjustable gain and af output, and the frequency centered on 1.65 MHz, the baseboard can then be mounted in the box and the wires soldered back onto the jacks and control. One final operating check and tuneup in the box and there you are.

The complete circuit is shown in Fig. 8, and it's a good one.

Conclusion

This little box replaces another breadboard in the 432'er receiver, and also makes a good general purpose i-f around the shack. . . . K1CLL

Gabe Gargiulo WA1GFJ
17 Whitney Street
East Hartford CT 06118

HOLD ON TO THAT RIG!

While looking through the ham ads recently I was stunned to see at least three ads of equipment for sale, with the excuse of "college expenses." Now just a minute! How much do they expect to get for a used station? $1,000? $2,000? It would have to be some station to sell for that much, second hand. And how far would one or two grand go in college? It might pay the tuition for one year in a small percentage of colleges. Selling a station when you need cash is not the answer.

I was greatly tempted a few years ago to sell some of my equipment (Swan 500C, Swan 400, Gonset GSB 2, two'er, D104 mike) simply because I needed the money due to marriage, bills, and a baby, all of which cost more than any college.

But, being a true ham, I kept convincing myself to hold on to that radio gear – things were bound to get better. They did, thanks to a programming job, and now I am back on the air and into 2 meter FM. If I had sold all my gear, I would still have the bills, but no rig, and a sorry ham I would be!

Look at it from a financial point of view. Sooner or later you will get out of your financial difficulty and will need to get back on the air. Then you will have to buy all new gear, which will cost you much more than you got for your old equipment. If you had taken out a loan when you needed the money, you would be ahead of the game (and still have your rigs).

Have you ever found out how much you can get for your old rigs? I did. A local distributor offered me $75 for my Swan 400 that I bought for about $450 in 1967. I was offered the same for my GSB 2. It's not worth it to sell them.

So, whatever the reason you are thinking of selling out, don't. You will get over the financial crisis and the ham radio bug will bite you again. If you don't need the money and have just lost interest in ham radio, don't sell out. Why not let someone benefit who is still interested in it? How about letting a teenager borrow it, or giving it to a radio club or to someone in DX-land?

Don't get out of ham radio – you may regret it if you do – but you'll never regret it if you stay with it.

. . .WA1GFJ

R.C. Altman WA6AXV
1053 Shrader Street
San Francisco CA 94117

IT'S A CALL

QST, QST, QST—Our new WR call has arrived." Thus our trustee, WA6AGA announced the event Tuesday afternoon, June 26th, just 5 days before the July 1 deadline, and 3 days before the announcement from the FCC of a 60 day extension.

I'm sure the members felt almost as they might have at the announcement of the uncomplicated birth of a son. After months of trying to meet FCC's complicated requirements for a repeater license (and 2 submissions), the best repeater in all of Six land, WB6AAE, had its new WR call. The trustee, Al Nielsen, first thought not even to open it, "let's have an unveiling ceremony," but his curiosity got the better of him, plus he decided having the new I.D.er wheel ready would make a better ceremony. One member promptly organized a pool of guessing the new call at 10c an entry, to be mailed to him not later than Saturday June 30. Pay-off to be at next club meeting July 27th, thus allowing for slow mail delivery.

Al immediately contacted the program chairman WB6GWQ Roy and said, "devise some kind of ceremony—probably upon the hill at the repeater site for this Sunday for a change of call."

Being one of the top program chairmen in the country, he immediately threw his hair-trigger brain into gear, phoned a brace of members for assistance, and pulled off another of his brilliant schemes. With plenty of on-the-air publicity during the next 5 days, we had 55 people up on the hill for the ceremony to take place at high noon on July 1.

A committee of two was picked to design a special QSL to be issued to any check-ins during the first 8 hours of operation under the new call. Tape recorders were hooked up to record the requests. Champagne and hot dogs were purchased, movie cameras were arranged for—a bed sheet was requisitioned for a banner—sprayed on it ahead of time was "WR6 " and the big day arrived. Beautiful weather, bright, not a cloud in the sky—perfect! The program chairman Roy tried to take credit for that too.

Beginning about 9:00 a.m. the trek was on from all over the San Francisco Bay Area. Many of the members even had breakfast together and went up into the Berkeley hills in a caravan. Some members drove 50 miles one-way from San Jose to be there.

The banner was strung up, ready to be raised on high, the hotdog broiler was plugged in and cooking, the champagne was on ice. Two of the more rotund members settled a long-standing argument as to which one could squeeze into the narrow space behind the repeater cabinet (they both did—so we still don't know which one is heavier).

A public address system was set up because only about 6 or 8 people could crowd into the shack to witness the changing of the I.D.er wheel, a running commentary was being given over the repeater by Little John WA6TKP, for the benefit of all not able to be there. Final entries into the dime pool were filed along with their guess at what the new call would be.

A little bit of history of the repeater was

announced over the p.a. system and over the air. It was first put on the air in 1962, first meetings were held in whose living room, and now we have 155 paid-in members, etc.

At 11:55 a.m. the last I.D. of WB6AAE went out over the air automatically, the wheel was removed, to the sound of taps bugled by Antioch John WA6ENM, the new wheel was installed and we waited—and waited—actually only about one minute, but it seemed like hours, then there it was—WR6ABM! Promptly as 12 noon, July 1, 1973. Antioch John promptly blew charge and shouts went up, ABM was sprayed on the bedsheet banner and it was raised about 30 feet into the air with feelings similar to those when you see the Stars & Stripes in a solemn moment. The air was filled with many many calls all at the same time, everybody listening trying to be first on the repeater with its new call. To listen to the tape now, it was mass bedlam, but in a minute they started settling down and calling in—in a more orderly fashion, placing their call and address on the tape for their request for the new QSL card. The last time I heard the total count—210 names and addresses were recorded.

Up on the hill, champagne corks were popping as much as 20 feet into the air. Everybody there had champagne and over 200 hotdogs were consumed in 30 minutes.

The trustee, Al Nielsen, WA6AGA was showered from behind with champagne as he retired the old wheel into what was called a cavity, but sure resembled a wastebasket, and burned.

One member, Lou WB6TXD surprised all of us by bringing a beautiful cake decorated like a birth announcement that said "IT'S A CALL." Movies of the entire proceedings were made by Sunset John WA6DPJ and shown at the next meeting, for the benefit of those that couldn't be there. He did a beautiful job of editing the film.

The dime pool contained $1.90 since we only had 5 days to publicize it, and was won by Clem WA6AVM. He picked the correct call because of his own call. A good time was had by all!

. . . WA6AXV

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A PROGRAMMABLE IAMIC CMOS KEYER

Part 2

Part of this article published in the June issue of 73 described the basic keyer portion of MOSKEY. In Part II I will describe how the memory circuit works and how Morse code is encoded to obtain high density storage in memory.

Memory Coding Scheme

A considerable amount of time was spent to determine the most efficient way to store the code into the memory to conserve memory space. When MOSKEY was first designed the largest static RAM available was a 256 bit TTL RAM. Just a 3 by 3 CQ sent twice would use up 680 bits of memory. Having only 4 RAMS, 1024 bits of memory, on hand, that didn't leave much room to program in other phrases. I decided the repeat capability was a must and began to look for a way to more efficiently store the code in memory. Now with 1024 bit static RAMs available memory space is not so much of a premium, but the same coding scheme is used here as originally designed. The simplest way to store the code is to sequentially store 1's and 0's in memory, with a 1 representing an output, and a 0, no output. The letter "A" would be stored as 10/1110. CQ with letter and word spacing would be stored as 1110 /10 /1110 /10 /00 /1110 /1110 /10 /1110 /000000/ using 34 bits of memory. One method to conserve memory space would be to store only 2 ones in memory for a dash, instead of 3 ones, and let the keyer automatically fill in the third time unit when sending a dash. Likewise only 2 zeros could be interpreted as a letter space, again letting the keyer fill in the missing space unit. A word space could be stored as 3 zeros in sequence and the keyer could lengthen it out to a 7 unit word space. CQ would then look like this 110/10/110/10/0/110/110/10/110/00/ using a total of 24 bits of memory space. Since there are only four instructions to be stored in memory: a dot, a dash, a letter space, and a word space, I decided that storing a two bit op-code, like a computer instruction, could be decoded into the four instructions. The op-code is read out of memory two bits at a time and decoded to control the keyer. The memory actually consists of 2 memory ICs operating side by side, with one op-code bit coming out of

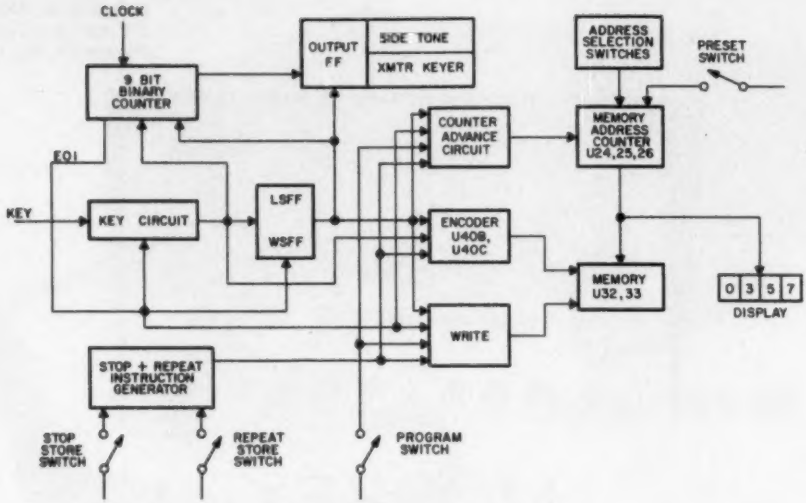

Fig. 6. Signal flow for programming memory.

memory A, and the second op-code bit coming out of memory B. Let the op-code assignment be the following:

OP-CODE BIT A	OP-CODE BIT B	CHARACTER
0	0	Word Space
1	0	Dash
0	1	Dot
1	1	Letter Space

Then CQ reduces to the following:

AB AB AB AB AB AB AB AB AB AB
10 01 10 01 11 10 10 01 10 00

using only 20 bits of memory. This is the way MOSKEY stores code in memory. MOSKEY is capable of storing 1024 characters, a character being a dot, dash, letter space, or a word space. The memories are 1024 bit N-channel MOS devices. They are CMOS compatible if the CMOS is operated at 5V. They were priced in the $70 range when first introduced a year ago, but have come down to $12 to $15 each now. Hopefully they will drop in price even more as the price of CMOS devices continues to decline.

Programming Memory

Figure 6 shows the block diagram of the keyer with the additions necessary to program memory. The encoder circuitry encodes dots, dashes, letter spaces, and word spaces into the proper op-code for storage in memory. The memory address counter is a 10 bit binary counter which sequentially accesses the 1024 locations of memory. After each instruction is written into memory the memory address counter is incremented by one.

The keyer is placed in the programming mode by turning on the PROGRAM switch. The memory address counter can be preset to any starting location by selecting a number on the address switches and pressing the PRESET button. This permits sequences to be stored anywhere in memory. The counter will start from the location it was preset to and continue from there. The sequence desired is loaded into memory by simply sending it on the key. As each dot, dash, letter space, and word space is sent, it is encoded and stored into memory by the write circuitry. When no further entries are made from the key, the keyer will store the word space into memory and enter the idling mode. Long gaps between words are not programmed into memory. Specific combinations of op-codes (to be discussed later) are used to program a stop instruction or a repeat instruction in memory. This is accomplished by pressing the stop store switch or the repeat store switch. The instruction will be written into memory and the memory address counter advanced by 1.

The display is used to see what location in memory is currently being used. By jotting down the starting location of each sequence programmed in memory, you can preset the address counter to that location and have the keyer send any one of several sequences stored away.

When programming memory, as each dot or dash is sent from the key, during the last bit time of the space following the dot or dash, when EOI is high, CLOCK 2 generates a write pulse to the memories and stores the op-code in memory. A new character is then started from the key. EOI DELAYED BAR is low during the first bit time of the new character and is an enable to advance the memory address counter at this time. The memory is then ready to have the next op-code stored into it during the last bit time of that character. When no further entry comes from the key, the keyer enters the letter space mode. During the last bit time of the letter space the op-code is stored in memory. Now comes a decision. If a key entry comes along, then it was really a letter space and the memory will be advanced during the first bit of time of the dot or dash being sent. If no key entry occurs then the keyer enters the word space mode to time out 4 more spaces. The memory is not advanced this time and during the last bit time of the word space the word space op-code is written over top of the previously stored letter space instruction. Then the memory is advanced during the next bit time. When the keyer is idling no writing or advancing of the memory takes place.

Sending From Memory

Figure 7 shows the signal flow for reading code out of memory. The starting location of the sequence is selected by the address switches and loaded into the memory address counter by pressing the PRESET switch. The counter will count up from this location as the code is sent from memory. Pressing the START button starts the keyer and it will send code until a stop code is reached, or it is stopped manually by pressing the STOP button. The op-code decoder decodes the memory outputs into dot, dash, letter space, or word space commands. After

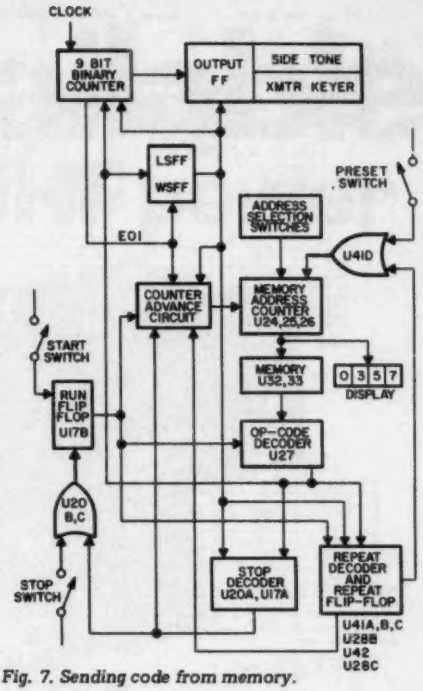

Fig. 7. Sending code from memory.

the keyer starts each new character the memory address counter is advanced during the first bit time of the character so that the next character to be sent is available. Since the keyer is self-completing, once a character has started, the next character to be sent can be read from memory, be decoded, and be waiting for the keyer to use it upon completion of the current character.

The word space instruction is really a two phase instruction. It must generate a 6 unit space. When a word space instruction is decoded from memory the keyer first enters the letter space mode and the memory is not advanced. With the word space instruction still valid and LETTER SPACE FF high, the keyer then enters the word space mode and advances the memory. The control logic is more complicated with this scheme but the maximum amount of code that can be stored in memory is utilized.

For those of you who peeked ahead to Fig. 8, the memory dot output of the op-code decoder is not used. It is implied that if the RUN FF is set then the keyer has to at a minimum send a dot. RUN BAR is

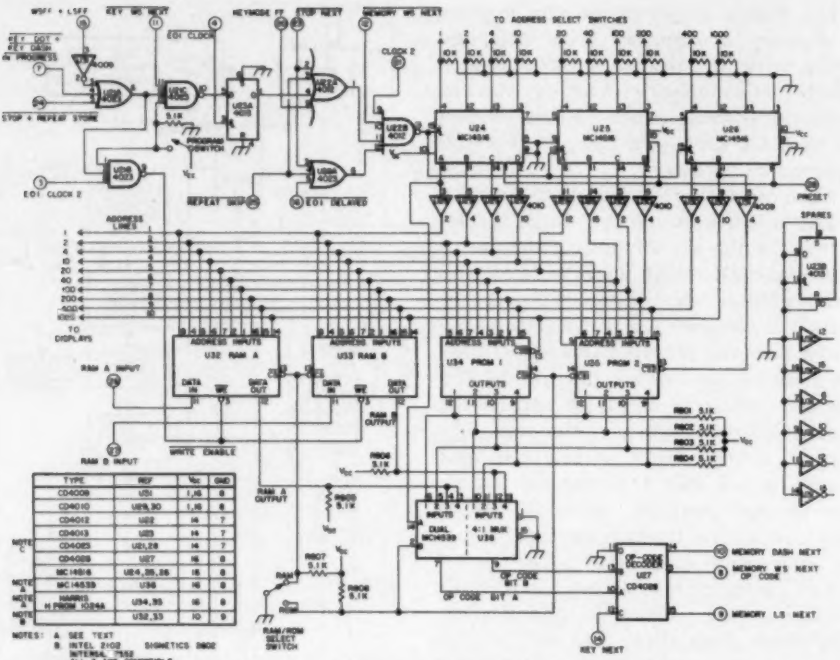

Fig. 8. Memory section of keyer.

used to keep the counter enabled, Fig. 3. The dot decode is not used, so if the keyer is sending from memory and no outputs of the op-code decoder are high the keyer sends a dot. A dash decode makes the counter count longer for a dash; a letter space decode is really a dot with the output inhibited; and a word space decode is a letter space sequence followed by a word space sequence.

PROMS

Figure 8 is the schematic of the memory section of the keyer. The memory address counter advance circuit is also included. U24, U25, and U26 are the memory address counters. Most CMOS devices cannot drive a TTL load so U29 and U30, non-inverting buffers, are used to increase the drive capability for addressing the TTL PROMS and driving the displays. U34 and U35 are the optional PROMS installed in the keyer. They are 256 word by 4 bit PROMS. U36 is a dual 4 to 1 multiplexer needed to select the proper PROM outputs. If you decide not to use the PROMS, U34, U35, and U36 can be eliminated Also R801 through R804 can be eliminated, as well as the RAM/ROM select switch and R807 and R808. Then connect RAM A OUTPUT U31 pin 12 directly to OP CODE BIT A U27 pin 10, and connect RAM B OUTPUT U33 pin 12 directly to OP CODE BIT B U27 pin 13. Resistors R805 and R806 must be left installed. Ground the RAM chip selects U32 and U33 pin 13.

Since the PROM is organized as 256 words by 4 bits a multiplexer is needed to select two op-code bits at a time. Figure 9 shows a simplified schematic of how this could be done. Assuming a sequence starts at location zero, all the address lines will be at a logic zero. The PROM will have the four data bits for its word zero at its outputs. Address line 1 is a select input to the 2:1 multiplexer and address lines 2 through 9 are used to address the PROM. PROM output 1 is selected by the multiplexer and appears as op-code bit A, and PROM output 2 appears as op-code bit B. The keyer uses this to start sending the first character and then advances the address counter to make address line 1 go high. This causes the multiplexer to now

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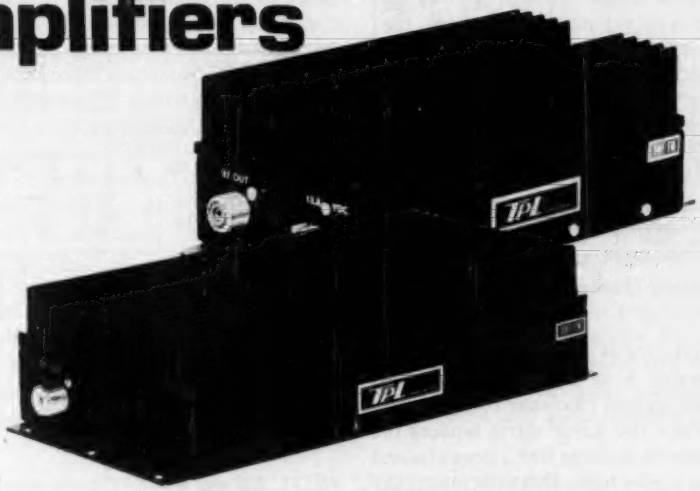

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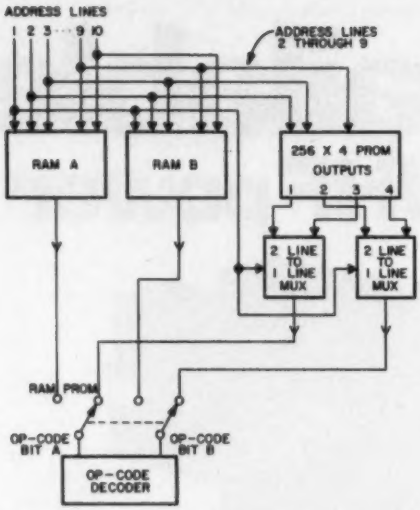


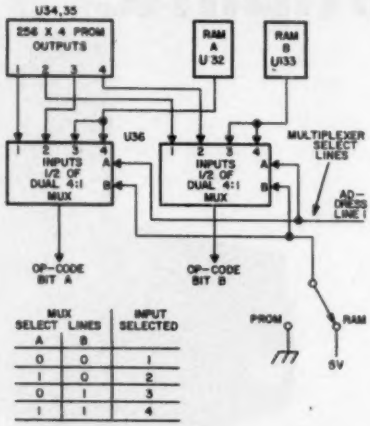
Fig. 9. A method to select 2 op-code bits at a time from PROM.

select PROM output 3 as op-code bit A and PROM output 4 as op-code bit B. This becomes the second character for the keyer to send. When the keyer starts sending the second character address line 1 goes low and address line 2 goes high. This now selects the second 4 bit word of the PROM and causes

Address Lines 10 9 8 7 6 5 4 3 2 1	Location shown on Display	Actual Decimal word of Prom used	Output Bit of Prom used as op-code Bit A	Output Bit of Prom used as op-code Bit B
0 0 0 0 0 0 0 0 0 0	0000	0	1	2
0 0 0 0 0 0 0 0 0 1	0001	0	3	4
0 0 0 0 0 0 0 0 1 0	0002	1	1	2
0 0 0 0 0 0 0 0 1 1	0003	1	3	4
0 0 0 0 0 0 0 1 0 0	0004	2	1	2
0 0 0 0 0 0 0 1 0 1	0005	2	3	4
0 0 0 0 0 0 0 1 1 0	0006	3	1	2
0 0 0 0 0 0 0 1 1 1	0007	3	3	4
0 0 0 0 0 0 1 0 0 0	0010	4	1	2
0 0 0 0 0 0 1 0 0 1	0011	4	3	4
0 0 1 1 0 0 0 0 0 0	0300	96	1	2
0 0 1 1 0 0 0 0 0 1	0301	96	3	4
0 0 1 1 0 0 0 0 1 0	0302	97	1	2
0 0 1 1 0 0 0 0 1 1	0303	97	3	4
0 0 1 1 0 0 0 1 0 0	0304	98	1	2
0 0 1 1 0 0 0 1 0 1	0305	98	3	4
0 1 1 1 1 1 1 1 1 0	0776	255	1	2
0 1 1 1 1 1 1 1 1 1	0777	255	3	4

Fig. 10. Table to help illustrate how address lines are related to number shown on displays, and actual word of PROM used.

the multiplexer to go back to selecting PROM outputs 1 and 2 as the op-code bits. Each word of PROM contains two characters of code. Figure 10 helps to illustrate how the PROM addressing works. The RAM/PROM select switch could be another dual 2:1 multiplexer. Since dual 4:1 multiplexers are available these two functions can be combined in a single IC and Fig. 11 shows how this is accomplished.



MUX SELECT LINES A	MUX SELECT LINES B	INPUT SELECTED
0	0	1
1	0	2
0	1	3
1	1	4

Fig. 11. The way MOSKEY multiplexes the PROM outputs and selects between PROM and RAM.

There are many versions of Programmable Read Only Memories (PROM) on the market, two of the more popular types being 256 words X 4 bits, and 32 words X 8 bits. These are manufactured with all 1's or all 0's stored, depending on the manufacturer and type. They can be programmed by applying proper voltages and pulses and any sequence up to the capacity of the PROM could be installed in MOSKEY. Once they are programmed, they cannot be changed back again. The PROMs contain nichrome fuse links in each memory cell which are safe against being blown out under normal operating conditions. With the proper voltages and current pulses applied the link in each desired cell can be melted open, or blown like a fuse, and the logic state of that cell changed. If you decide to install a PROM in your keyer give it a good hard look before committing to a sequence. Check and double check it several times as mistakes cannot be corrected. I do not recommend

trying to program a PROM by yourself. It's too easy to make a mistake with so many bits to program and the exacting step by step sequence that must be followed for each bit. If you decide to use a PROM let the parts store program it for you. Some charge a small fee, and others will do it free. With the large memory size available in the keyer, and the ease of programming it, one might consider that a PROM is not really necessary at all. However the RAM is a volatile device which means that when the power is removed the contents of the RAM are lost, and without a PROM your favorite saying will have to be reprogrammed each time the keyer is turned off.

Figure 12 shows how 32x8 PROMS could be implemented. Loading of the address lines must be watched. The 3:8 decoder could be a 7442 TTL chip or 4028 CMOS chip with inverting buffers used after it.

Stop and Repeat Instructions

Figure 13 shows the schematic of the stop and repeat instruction generators, the repeat circuit and the op-code encoder. With the coding scheme used in MOSKEY it may have become obvious by now that letter space instructions can only be followed by dot or dash instructions, and likewise word space instructions can only be followed by dot or dash instructions. Up to four special control instructions could be implemented by storing two letter spaces in a row, or a letter space followed by a word space, or two word spaces in a row, or a word space followed by a letter space. MOSKEY uses two of these combinations to generate stop and repeat instructions. After the last dot or dash entered from the key is encoded and stored into memory, the keyer generates a word space op-code, stores it in memory, and then idles. By using a manual switch closure to enter a letter space or word space op-code into memory in the next location, it will be interpeted when sending from memory as a STOP or REPEAT instruction, respectively. This is done by pressing the stop store switch or the repeat store switch while the keyer is idling. The instruction will be written into memory and the address counter advanced one location. Switch de-bouncers and synchronizers are used on

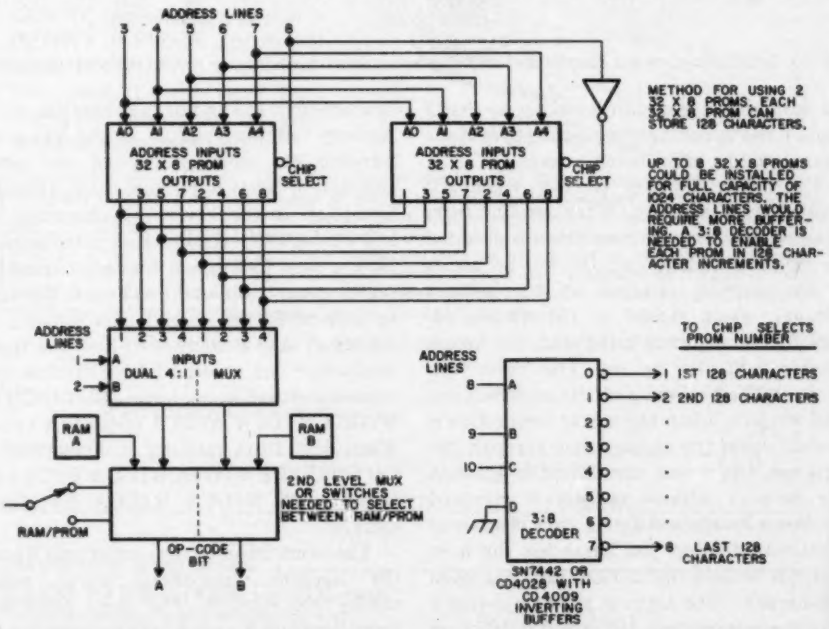
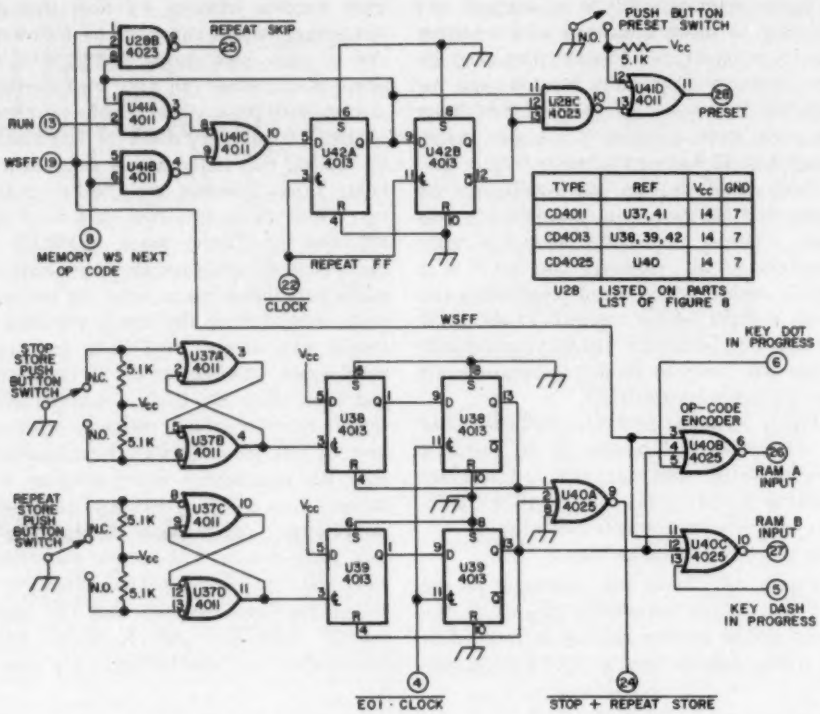

ADDRESS LINES
3 4 5 6 7 8
A0 A1 A2 A3 A4
ADDRESS INPUTS
32 X 8 PROM
OUTPUTS
CHIP SELECT
METHOD FOR USING 2 32 X 8 PROMS. EACH 32 X 8 PROM CAN STORE 128 CHARACTERS.
UP TO 8 32 X 8 PROMS COULD BE INSTALLED FOR FULL CAPACITY OF 1024 CHARACTERS. THE ADDRESS LINES WOULD REQUIRE MORE BUFFERING. A 3:8 DECODER IS NEEDED TO ENABLE EACH PROM IN 128 CHARACTER INCREMENTS.
ADDRESS LINES
INPUTS
DUAL 4:1 MUX
RAM A
RAM B
2ND LEVEL MUX OR SWITCHES NEEDED TO SELECT BETWEEN RAM/PROM
RAM/PROM
OP-CODE BIT
TO CHIP SELECTS PROM NUMBER
3:8 DECODER
1 1ST 128 CHARACTERS
2 2ND 128 CHARACTERS
8 LAST 128 CHARACTERS
SN7442 OR CD4028 WITH CD4009 INVERTING BUFFERS

Fig. 12. How to implement 32 x 8 PROMS in Moskey.



TYPE	REF	V_{cc}	GND
CD4011	U37, 41	14	7
CD4013	U38, 39, 42	14	7
CD4025	U40	14	7

U28 LISTED ON PARTS LIST OF FIGURE 8

Fig. 13. Schematic of repeat decoder and stop and repeat instruction generator. Also the op-code encoder.

the stop and repeat store switches so that a single pulse synchronized to the keyer clock is generated by each switch closure.

The repeat flip-flop is reset when not sending from memory. When sending from memory and a repeat instruction is decoded the memory address counter will be preset to the number selected on the address switches, which should be the starting address for the sequence being sent. The repeat flip-flop will also be set. The keyer will return to the beginning of the sequence and send it again. When the repeat instruction is reached again the second time through the sequence, the repeat instruction is ignored. The memory address counter is advanced one more location skipping over the repeat instruction to that the keyer has the next valid dot or dash instruction ready for when it is needed. (The keyer is self-completing a word space at the time the repeat instruction is decoded and inputs to the 9 bit counter, the dot, dash, etc., generator are being ignored until the end of the character, so the memory advance circuit in the keyer can advance the memory beyond the repeat instruction and not cause any abnormal operation in the keyer. All characters will still be perfectly timed.) It is permissable to have a stop instruction immediately after a repeat instruction and it will cause the keyer to stop after the second pass through the sequence. As an example of how the repeat instruction can be used I have the following sequence stored in my keyer: CQ CQ CQ DE W1GCA W1GCA W1GCA (repeat) K (stop). When sent from memory it comes out as: CQ CQ CQ DE W1GCA W1GCA W1GCA CQ CQ CQ DE W1GCA W1GCA W1GCA K (stop).

The conclusion of this series will discuss the sidetone, transmitter keyer, power supply and displays. The spare gates indicated in Figs. 5 and 8 will be used for the sidetone and transmitter keyer.

... W3HPX

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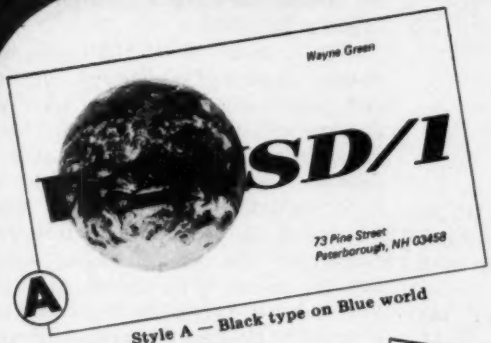

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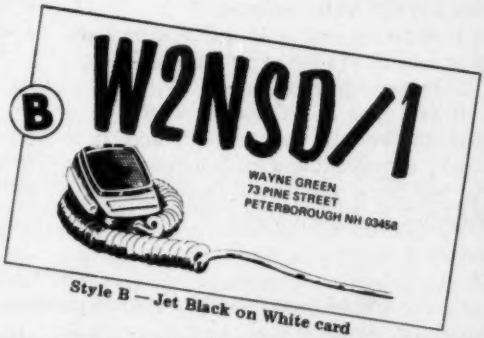

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OSCAR 7

With One Receiver

After reading the fine technical articles on preparing for OSCAR 7, perhaps you are wondering how you will use all of the OSCAR 7 capabilities without:

1. Buying a new crystal for your 144 MHz and 432 MHz converters.

2. Retuning your receivers 10 meter band to include 29.975 MHz and losing 28.0.

3. Tying up several receivers.

If you have an NC-300 or NC-303 as a spare receiver at your station, here is a simple, convenient and inexpensive solution that will allow you to use both OSCAR 6, OSCAR 7, and the low end of 144 and 432 MHz bands without adjusting or changing crystals in the equipments.

The downlink signals for the two satellites are listed in Table 1, along with receiver requirements for 28 MHz i-f VHF converters. Very few ham band receivers cover frequencies above 29.9; however, the NC-300/303 series has a converter band that begins at 30.0 MHz.

Fig. 1, shows an NC-303 configured to monitor all three of the OSCAR 7 downlinks and beacons using the receiver band switch and one external coaxial switch. The only modification necessary is to tune the capacitor in the NC-303's converter band local oscillator such that 29.9 MHz is received at the 143.5 MHz (30.0 MHz) dial calibration. This should be accomplished with the receiver in its cabinet. At this time you should also adjust the air trimmer in the rf amplifier by using the crystal calibrator as a signal source.

I do recommend the use of a good solid state 10 meter preamp as shown in Fig. 1. An additional coaxial switch could be used to return the converters to the 10 meter input for a complete satellite, 432 and 2 meter station in one receiver.

. . .W3HUC

TABLE 1

OSCAR 6 and OSCAR 7 input, output, beacon and station receiver requirements.

	UPLINK (MHz)	DOWNLINK (MHz)	RECEIVER (28 MHz IF)
OSCAR 6	145.9-146.0	29.450-29.550	29.450-29.550
BEACON		29.450	29.450
OSCAR 7	145.850-145.950	29.40-29.50	29.40-29.50
	432.125-432.175	145.975-145.925	29.975-29.925
BEACONS		29.5	29.50
		145.98	29.98
		435.1	31.1

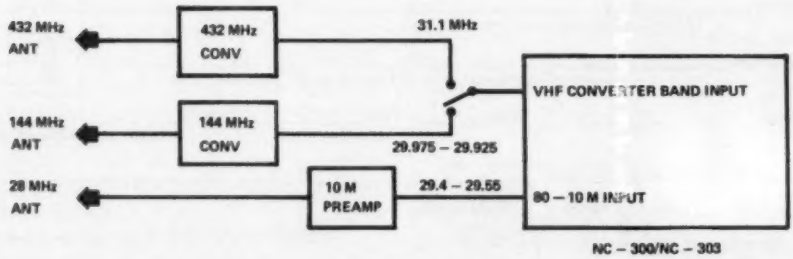


Fig. 1. A single receiver for satellite use.

73 Staff

HIGH OUTPUT ACCESSORY MICROPHONE

Frequently with either an SSB or FM rig the built-in microphone amplifier does not produce sufficient gain to achieve full modulations when used with an existing microphone. There are several obvious solutions to this problem but while either the technical or economic aspects are being solved, one might consider the use of the auxiliary microphone described in this article. Its output level is variable and can exceed that of a dynamic microphone used with a microphone preamplifier. The cost is extremely low and yet it has a very good speech-engineered response. Needless to emphasize, it is extremely rugged and durable.

Before going too far in describing the virtues of this microphone, it should be pointed out that a carbon type microphone is the theme of this article. Before discarding the idea because carbon type microphones evoke memories of old, noisy, telephone-sounding instruments, one should consider that even carbon microphone technology has advanced in recent years. No suggestion is made that one use any of the old war surplus type carbon microphones. However, the newer telephone type carbon microphone elements, and particularly those developed for use in private telephone-type intercom systems, are definitely good speech quality units that proudce a minimum of noise. Listen carefully once to a modern telephone type unit and the audio quality it provides. The particular carbon type element shown in this article is an imported type used in intercom systems but any of the new replacement types available from microphone manufacturers should provide an equal or better level of performance. (Fair Radio Sales, Lima, Ohio 4582 has a number of modern, excellent grade military surplus types.)

Microphone Circuit

The quality and reliability achieved from a carbon type element depends a great deal on how it is connected into a single circuit which provides a resting current through the microphone element. One fact that is immediately apparent when experimenting with modern carbon elements is that ex-

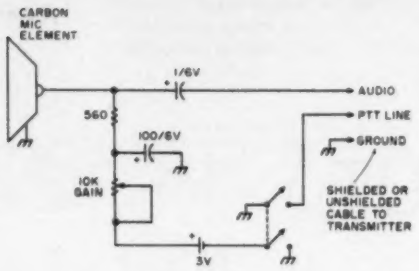


Fig. 1. Complete microphone assembly with gain control.

tremely little current has to flow through the microphone to provide a good level of output. For instance, the circuit of Fig. 1 provides a current through the carbon element (when the push-to-talk switch is activated) which is determined by the 3V battery and the series combination of the 560 fixed and 10K variable resistors. Even with full resistance in the circuit, the output level is approximately equal to that of a high output level dynamic microphone. This represents a current of less than 1 mA and was one reason, as described later, why the batteries for the microphone were placed in the microphone enclosure. Under normal usage, their life will approach shelf life. The 100μF bypass capacitor isolates the 560Ω resistor as the terminating af impedance for the microphone elements. This resistance value can be varied up to several thousand ohms if it is found that doing so provides a better match or output level when used with a particular amplifier. The push-to-talk switch simply activates the normal push-to-talk line for a transmitter as well as completing the battery circuit for the microphone during transmit.

Since the microphone circuit is inherently a low impedance circuit, one does not absolutely have to use shielded cable to the transmitter although it is recommended. One thing that will be immediately obvious is the lack of problems that occur with rf feedback when using the microphone. It is quite a contrast to the situation that usually occurs when one uses a low level output microphone and an accessory preamplifier external to a transmitter.

Construction

The microphone along with its batteries can be enclosed in almost any simple enclosure that can accommodate the volume of the components. The enclosure need not be a metal unit. I simply used a clear plastic box (later painted black) which measured about 2x3x½ in. and provided a comfortable "feel" when hand-held as a microphone enclosure. A number of holes were drills in the enclosure in a more or less circular pattern where the microphone face would press against the enclosure. A thin foam plastic sheet (or grill cloth) should be placed in the enclosure behind the holes to act as a moisture and wind screen.

The mounting of the rest of the components is simply a matter of convenience. The only component that one might want to check the mounting of carefully is the push-to-talk switch. Strangely enough, many people who are normally right-handed will hold a microphone in their left hand and a mounting for the switch in the upper right hand portion of the enclosure will prove the easiest to use. I used regular AA batteries but the current drain is so low, button type batteries can be used and the enclosure size reduced even further. The 10K variable resistor was brought out on the back panel of the enclosure with a screwdriver slot shaft as a convenience when making tests.

Summary

The simple microphone described was not intended to replace more expensive dynamic units and aside from its high output no claim will be advanced that it sounds better than an expensive dynamic microphone. However on the air tests have shown that it does sound as good as inexpensive dynamic units intended for speech usage and, of course, far superior to cheap tape recorder dynamics for speech purposes. The output level can be adjusted to *at least ten times* that provided by a dynamic microphone and the whole assembly provides an ideal interim solution to the problem of working with a transmitter that requires an unusually high microphone input level or with FM stations or repeaters that require varying deviation levels.

. . . 73 Staff

Cassette Code Courses

With these Code Courses from 73, the average person can learn the International Morse Code fast enough to pass FCC code exams from Novice thru Extra Class in a few painless hours! One of the beauties of cassette tapes is that you can take them with you anywhere – at work for lunch break (code on rye is great) – even in the car while you are driving (or what's more likely, moldering away in line at a service station *trying* to get gas). With the help of these tapes passing the code portion of the various exams is a gas . . . *er* . . . snap!

My class was so enthused over your code cassette tapes that after hearing the 13 word per minute cassette every student in the class decided to get one for home practice. Enclosed is an order for 23 of the 13 word per minute tapes.

K6MLC

After about a week of playing your 13 word per minute cassette (which I timed out at 14 words per minute, incidentally!), I went down and passed the General exam with no strain. The plain language of the FCC exam seemed so slow that I lost all fear after the first few letters and made perfect copy from then on. It's fear that gets you, and your tape gave me confidence. Thanks!

WN9JGQ

I've been teaching code for over twenty years now and I've tried every record and tape and other gadget that has come out. Let me say that the 73 MAGAZINE code course is by far the finest that I have ever heard. I never thought I would learn new tricks, but you've taught me a lot about teaching code. Suffice it to say, I am recommending that every student of mine get your tapes.

K1IF

My wife, who has been almost totally resistant to the code, breezed through your 5 word per minute beginners cassette and was ready for the Novice exam in one day.

WB8JON

---

1 **Basic 5 WPM Code** – this cassette code course will teach the IMC at five words per minute, all letters, numbers and punctuation. The tape not only gives all these characters, but gives them in a very simple order so you can start copying code within one minute of hearing it. This has got to be the easiest way to learn code ever invented. The cassette actually has the code being sent at 6 WPM, allowing a margin for operator panic when the chips are down and the real exam is at hand.

Basic Code 5 WPM – 60 min. **$3.95**

2 **6 WPM Practice Tape** – (also known as The Back Breaker) this is a toughie – five character code groups sent in no particular order, so there is no way to memorize the tape. It is sent at six words per minute to give you that margin for error you'll need when faced with a stern examiner at THE EXAM. Practice in your head or on paper wherever you are, whenever you have a minute or two.

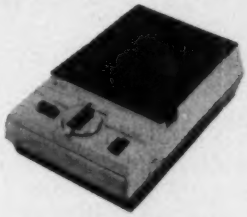
BB-6 WPM – 60 min. **$3.95**

3 **13 WPM Practice Tape** – This tape will take anyone over the hump which exists when you have to stop translating the dits and dahs, and go to an automatic recognition system where you "know" what the character is without thinking, thus enabling you to pass the general or advanced code test. This very nasty tape is really at 14 wpm, to give you that added edge when taking the exam.

BB-13 WPM – 60 min. **$3.95**

4 **20 WPM Practice Tape** – This cassette has been fiendishly designed to get you through the FCC Extra Class code test with flying colours. The code on this actually runs about 21 words per minute, though it starts out at a lazy 18 per for the first few minutes. The intermix of letters, numbers and punctuation instead of plain language will give you such an edge when you sit down to take the exam that you should be able to breeze through. Though much of your practice with this cassette can be just copying in your head – after all, the important object of practice is to train your brain to convert code into letters – be sure that you exercise your pencil too. The cassette will make your code practice portable, available to you whenever you have a few minutes to spare – even while driving.

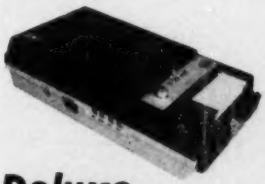
BB-20 WPM – 60 min. **$3.95**



Cassette Recorder

Here is a cassette recorder that is ideal for use with the code courses since it can be operated anywhere.

Comes complete with four "D" batteries, AC power cord, earphone and mike and is useful for dozens of ham applications. Cassette tape recorder is available for only **$23.95** (plus $1.00 for shipping and handling).



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PETERBOROUGH, NH 03458

Walter W. Pinner WB4MYL
7304 Lorenzo Lane
Louisville KY 40228

A High Power Low Pass Filter

The construction of a low pass filter capable of handling maximum legal power levels is usually complicated by the following factors.

1. Most construction articles describe units for 250 watts or less.
2. Filters for higher power levels require special capacitors which are not readily available (not to mention cost).
3. The physical size of such capacitors increase the over-all size of the unit, if variable, require equipment for alignment and usually will not lend themselves to following the original layout.

The filter described herein requires *no* capacitors, double-sided copperclad board is used as the capacitive elements. If the dimensions are followed NO alignment is necessary, and the overall size is *small* 5x5x24.5 cm.

The materials needed for construction are, double clad copper board 1.5mm (1/16"), #10 solid copper wire and 2 SO-239 connectors.

The circuit for this filter is not new, but the use of copper clad board for the capacitors is. This filter is designed for use in 52 ohm lines, but any standard filter may be built by applying the capacitance value of the board per square inch and calculating the box size accordingly. The capacitance of 1.5mm (1/16") double clad board was measured at 14 pf per 6.5 sq. cm. Phenolic or epoxy measured essentially the same. 2mm (3/32 in.) board measured 8 pf per 6.5 sq. cm.

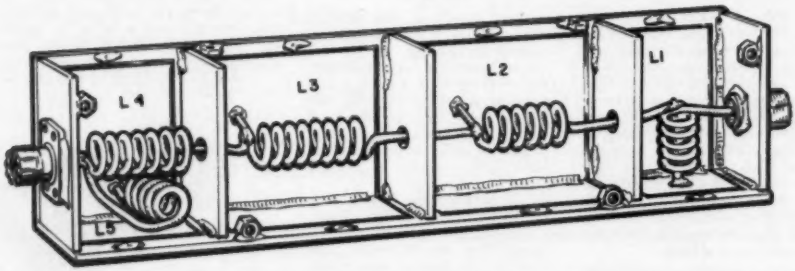


Fig. 1. Pictorial view of the low pass filter. It is built entirely from double sided copper clad stock, with etched out sections of the board serving as capacitors.

A line drawing of the low pass filter is shown in Fig. 1. There are four shielded compartments. The inside walls of each section form one plate of the capacitor with the outside of the box forming the other plate.

The box ends, dividers and foil track are all at ground potential. Fig. 2 shows the electrical circuit of the filter. The copperclad board parts are all soft soldered in place. Fig. 3 is the dimensional drawing of the board which makes up two sides of the box. The .3cm (1/8") cm wide insulating tracks may be etched or cut using a hobby or carpet knife and the foil peeled away. The board is then cut in half, the cut ends filed to a 45 degree angle and the two halves

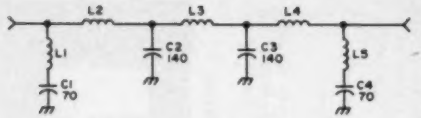


Fig. 2. Schematic of the filter. All coils are #10 copper 1.2cm (½") inside diameter. L1 and L5 are 5T, 2cm (¾") long; L2 and L4 are 6T, 2.4cm (1") long; L3 is 8½T, 3.8cm (1½") long.

soldered together being sure to solder both the inside and outside surfaces. The method of bonding the inner ground track and the outer surface together is via a number of holes drilled through the board with pins or wires passed through and soldered to each copper surface. The shields can also be made of copper clad with (.6cm) holes bored through their centers for coil connections.

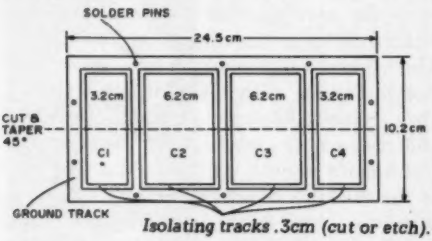


Fig. 3. The capacitors are formed by etching isolation tracks around sections of foil.

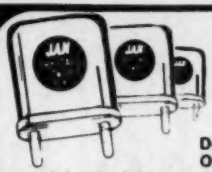
The cover may simply be light weight aluminum bent at a 90 degree angle and holes drilled to line up with the mounting nuts soldered to the inner ground track. Wind the five coils from the table below and solder them into the box using Fig. 1 as a guide to positioning. Install the cover and hook-er up. The filter I constructed worked fine when 1200 watts were run through it into a 50Ω dummy load. No increase in swr was noticeable. The frequency cut-off is at 30 MHz, with the attenuation falling sharply to 40 MHz.

. . . *WB4MYL*

COIL TABLE

	No. of Turns	Length	
L1 & L5	5 turns	3/4 in.	1.9cm
L2 & L4	6 turns	15/16 in.	2.4cm
L3	8½ turns	1½ in.	3.8cm

All coils #10 solid copper wire 1.1cm (7/16) inside diameter.



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JOB OPENING FOR PERSON WHO CAN READ AND WRITE

Editorial Assistant for 73 Magazine

Person should be well read, particularly in electronics, and know a nor gate from a neutralizing capacitor. While not many articles in 73 are re-written, many do need attention as far as speling and grammar is concerned. Not casting any stones, but we don't want 73 to print garbage like you find in Brand X magazine.

Said job pays a lot more than it ought to, considering that New Ham Shire is one of the very best places in the whole US of A to live (ask any Californian who has had the good fortune to move to NH!). No sales tax – no income tax – rolling green hills and beautiful mountains (for DXing on VHF) – incredible 2m territory (would you believe eight repeaters on the air in NH and three more under construction!).

The A. Editor prepares articles and newspages for publication – editing them, making sure the pictures are okay, and works with the authors to make sure that everything is the best it can be.

If you are qualified and think you might like to join the gang at 73, write and tell Wayne about it.

73 Magazine – Peterborough NH – 03458

Harry Simpson W4SCF
PO Box 27015
Memphis TN 38127

IT WAS A BENCH JOB

We were scheduled to leave on vacation the next week so I took my charming red-headed helpmeet, WB4ECK, in for her 10,000 mile checkup. The Doc told us to run, don't walk across the street to the hospital for an operation. Everything came out all right (E-e-c-c-k-k!) and while she was convalescing, I asked her to tell me all about the operation.

She said, "Well, I'll try to explain in terms that you can understand. First, they removed the chassis from the cabinet and placed it on the bench. A visual inspection followed, and certain parts were suspect. This called for a closer examination of the various components.

A scope was hooked up, as was a spectrum analyzer and a VTVM. The master oscillator was checked for distortion – fortunately none was found. However, the VTVM showed a higher supply voltage than that outlined on the spec sheet, and a procedure was outlined for reducing that potential in the future.

The main difficulty was discovered in the harmonic generator, and after a conference with the shop foreman it was determined that this unit was beyond repair – and at the same time was of no importance to the overall operation, in relation to its current use. It was also decided that the parts making up this generator could continue their deterioration and damage the entire assembly if not completely removed – just as you remove dead batteries from a VOM!

After allowing an overnight cooling off period, the bench crew got down to work early the next morning while everyone was fresh, and began the conversion. In order to keep down extraneous noise – there was nothing wrong with the audio amplifier – they reduced the power to a very low level, and started to work. With all the test instruments hooked up, they cut a long slot in the shielding which enclosed the defective generator, and using diagonals and long-noses, very efficiently removed the troublesome components, and then placed jumpers in certain locations to insure proper future operation.

Following a careful visual inspection to assure themselves that they had left no tools inside the compartment, they carefully replaced the shielding, and sealed it with a slow-hardening type of epoxy. Then they gently raised the operating voltage back up to normal. Fortunately, everything worked, and the chassis was moved to a cool, quiet spot to wait for the epoxy to set.

Attached to the repair bill were instructions to cushion the device, thus protecting it from mechanical shock, vibration and bouncing, and to let it run on idling current at first, then gradually increasing the duty cycle, until finally the rated output is reached."

W4SCF: "Chee – well, if they didn't leave any cold solder joints at least you don't have to be bothered with harmonic filters . . ."

. . .W4SCF

73 Books & Stuff

the Books

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This book presents the basics of two meter FM operation and repeaters in short form with the end in mind of getting you on FM quickly and easily.

It is easy to make some blunders when you are getting started with anything new. It is also embarrasing. A fast reading of this book should help you avoid the pitfalls.

VHF PROJECTS FOR AMATEUR AND EXPERIMENTER

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A must for the VHF op. Opening chapters on operating practices and getting started in VHF, both AM and FM, followed by 58 chapters on building useful test equipment, modifying existing and surplus gear, building complete stations, both fixed and portable, linears, converters, control units, preamps, band scanners, antennas, noise suppression, plus many more.

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All about broadcast band DXing, tuning the tropical DX bands, DXing radio amateurs, antennas for shortwave, radio licenses, pioneers in electricity and radio, commercial broadcast stations, WWV, etc.

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Discusses all types of interference problems in great detail with recommended steps to cure these problems. Good for both the amateur and citizens band operator. Try this cure and suffer no longer.

IC PROJECTS

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This book tells how to understand and use ICs, with numberous construction projects.

COAX HANDBOOK

$3

All about coaxial cables, connectors and applications. It's all here — pictures, part numbers and specifications for all types.

SOLID STATE PROJECTS

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Crammed full of home construction projects, from receivers to transmitters and all in between. Chapters include such articles as zener diodes, how they work, how to use, test and buy them; integrated circuits; how to design transistor amplifiers; and many more.

DX HANDBOOK with MAP

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How to work DX, how to get QSL'S, country lists, award lists, QSL bureaus, maps of the world, great circle maps centered on major U.S. cities, DX bearing charts for major U.S. cities, how to go on your own DXpedition, and much more. Wall size DX map of the world included.

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SLOW SCAN TELEVISION HANDBOOK

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Would you believe that the secret to success in VHF/UHF is in the antenna system? This is no earth shaking discovery, but it's true. A complete, detailed book with descriptions, dimensions, tuning data, diagrams and photos. Antennas from the instant coathanger to the giant collinear beam can be found here.

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RTTY-DXDC **$1**

Frame and hang this one above your machine. All operating award for those who have submitted proof of 2-way teletype communications with 10 countries. Endorsement provisions for different bands.

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Dress up the shack with this award for 2-way Slow Scan Television communications with 10 countries. Endorsement provisions for separate bands.

ALL MODE DXDC **$1**

How many can qualify for this one? An award for 2-way communications with 10 countries using CW-SSB-RTTY-SSTV modes.

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This is an assortment of twelve different back issues of 73 from the years 1960 through 1964. Normally these back issues would cost you $1 or more each, but since this assortment is our choice instead of yours you benefit with a big bargain. Here is a good way to build up your technical library with hundreds of interesting and valuable technical articles and construction projects.

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WORLD DX MAP **$2**

This is the same wall-sized DX map that is included with the DX Handbook except it comes to you rolled up instead of folded. This is so you can put it on the wall or have it framed. The map is designed with all country prefixes indicated and space for you to color in the countries as you work them. Visitors can see immediately how much of the world you have contacted! The zones are on the map as well as prefixes. Maybe you need several maps.

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An amateur who works for a big computer company has a program which permits him to plug in your location and have it print out the bearings of all the countries of the world from your shack. Once you have this list you will use it for every DX contact. The chart gives the bearing and distance to all major cities and countries. Be patient when you order for these have to be run through in groups so that we can offer them to you at such a low cost.

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Gabriel F. Gargiulo WA1GFJ
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HAM RADIO AND FOREIGN LANGUAGES

We hams have a rare privilege. By picking up a microphone we can talk with people almost anywhere in the world. Few can afford to travel abroad, but we can all afford to visit in the living rooms of foreign hams by the magic of amateur radio.

What we say on the air can make someone's day a bit happier or it can make it a disappointment. What goes out through our antennas can affect what many people think of America.

Most Europeans think that Americans are loud, rude, free-spending, and ignorant of any language other than English.

Those of us fortunate enough to enjoy ham radio can do a lot to create a good impression of our country. We can learn the other fellow's language and talk to him in it.

By learning someone else's language we take the first step in opening our mind to him, and in communicating with him. A language is not just a way of saying things. It represents a person's whole culture, his heritage, his way of thinking, even his religion. When you learn and use his language you are saying: "Your way of life, your culture, your values are important to me. I want to be closer to you."

English is not the only language in the world. It happens to be the dominant one only because the United States is a dominant world power, and because Americans and British refuse to learn other languages. English is dominant on the ham bands because most hams are Americans, and they will not learn a foreign language.

If you decide to learn a foreign language, here are a few pointers:

1. Choose a language. It may be one you had in high school, or the language your grandparents spoke. Try to pick one you are likely to hear on the ham bands, such as Spanish, French, German and Italian. Choose one you can learn easily. There are many materials available for learning

73 DUZZ

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73 MAGAZINE INC. *Peterborough, New Hampshire 03458*

Spanish, French and Italian, but few for learning Albanian or Flemish. The best choices seem to be Spanish, French, German or Italian.

2. Then learn a little. Get hold of tape recorded QSO's (advertised in ham publications), language records, (Dover Publication, New York) or take a course at any one of many language schools ready and waiting for you.

3. Use what you know. You can always fall back on English. But remember, English is a foreign language for the other fellow. Why should he speak your language and not you his?

4. Don't be a perfectionist. Unless you can live in the country more than three or four years, you will probably never speak the language like a native. So speak as correctly as you know how, but speak to be understood.

5. Ask your contact for help. Few will refuse to coach someone making the effort to learn their language.

In just a few month's time you'll have learned to speak a foreign language, advanced international relations, and added many hours of enjoyment and warmth to your hamming. What language will you learn?

. . . WA1GFJ

Editor's comments:

The most difficult part of speaking a foreign language is getting started. It can be frightening – like learning to walk. You feel insecure and embarrassed.

I suggest that you get started slowly and easily in the first stages. If you start out by learning some of the basic ham contact info in the foreign language, and then get so you can give more and more of that, you will be on your way. After all, if you've worked many Italian stations you may have discovered that a lot of them don't seem to know any English at all, yet are able to give you the regular ham contact routine in English. As long as you stick to the name, town, and signal report you are okay. Take a page from their book for starters.

Eh bien, mon ami? Pardon, s'il vous plait, mais nous desirons parler en Francais pour un moment.

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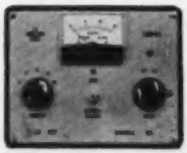

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E.R. Davisson K9VXL
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SIMPLE SIX PRE-AMP

An easily built pre-amp that will increase the sensitivity of a low priced receiver without the necessity of complicated impedance matching.

Ever wish you could add just a little more oomph to that six meter station on receive? Well, how about a low cost, simple, preamplifier which requires very little work? Although only one transistor is utilized, this little preamp has outperformed some one and even two tube preamplifiers costing many times more. The main consideration here is that you don't have to get fancy and expensive to add a little zip to your six meter receiving set-up.

Figure 1 is the schematic of the unit. At first glance, it appears as any other straight forward amplifier. However, several things were done to increase its overall effectiveness.

Notice the output circuit. Utilization of the commercial choke produces one big benefit. Due to lower Q than would be obtained with an air wound coil, no tuning is necessary. The bandwidth at the half power points will be approximately 10 MHz. In other words, you'll notice very little difference in gain across the entire six meter band. Tuning of the output circuit is accomplished by the 6 pF capacitor. By using 50 pF in series with the 6 pF across the tank coil, the equivalent capacity across the coil tunes the circuit to the six meter band. By taking the output from across the 50 pF, gives an impedance of approximately 50Ω for matching purposes.

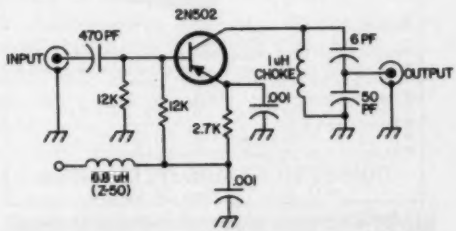

Fig. 1. Schematic diagram for simple six pre-amp.

Don't be fooled by the lack of an input tank. Use of the fairly large coupling capacitor and no tank circuit eliminates the problems of detuning often caused by different lengths of coax.

Where this pre-amp shines is with receivers of tube input (especially those without an rf stage). Typical performance of this little pre-amp with one well known receiver produced the following results. The noise

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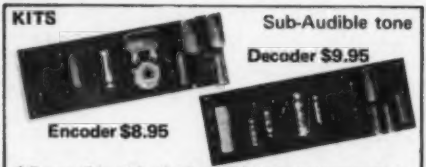

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level increased one S unit, whereas the signal level was increased three S units. The performance is better due to the inherently lower noise figure of transistors compared to tubes.

Do you have a super regenerative receiver on six? This little pre-amp ahead of it can really make a difference in performance as well as cutting down on the radiation common to that type of receiver.

With the 2N502 specified, typical power gains between 15 and 20 dB have been measured. Drain from a 9 volt source runs less than 50 milliwatts.

One word of caution: make sure the input is separated from the output when you build up this little pre-amp. Several were built (not by me) where this was not the case. What you'll end up with is a preamp for six as well as a converter (but, who knows for what band).

The choke in the supply lead may or may not be necessary. In some applications it was necessary to use the choke.

To increase its effectiveness, try raising or lowering the voltage a little. You'll find a point where the best ratio between noise and signal level may be reached.

For the more ambitious builder, we might offer the following suggestion. One version of this pre-amp was built where commercial chokes were switched giving us coverage for 6, 10, 15, and 20 meters. We used a string of live commercial 1 μH chokes. The bandwidth for the lower frequencies will correspondingly decrease. This, of course, helps due to the decreasing frequency spectrum you are interested in.

If you're really daring, build two, and use them in series. Be careful here though, as lead dress, component placement, etc., all become about ten times more important.

So, next time you wish for a just a little more oomph on six, give this extremely simple circuit a try.

Incidentally, 14 turns of number 22 wire, 3/8 inch diameter, air wound can be used for the 1 μH choke at a sacrifice of bandwidth.

...K9VXL

Paul Schuett WA6CPP/WA7PEI
Box 10
Wallace CA 95254

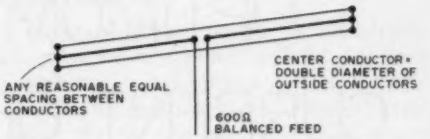
THE THREE-WIRE DIPOLE

After having been on the air a year or so, I ran into an old timer who was running a 3-wire dipole. I was running an ordinary dipole on 40m and a folded dipole on 75m, but had given no thought to a 3-wire dipole. He mentioned that it was a good antenna; I thought it would be an interesting try. So, one spring day, with nothing much better to do, I solicited the aid of the Jr. Op. and we commenced the 3-wire dipole.

First you need some spacers. About this time I ran across someone connected with an advertising sign company, and he gave me some scrap plastic. A moment with a band saw and a drill gave the necessary spacers. A few minutes perusing the antenna handbooks gave me information on impedance stepup vs. wire size and spacing. For simplicity, we used the center wire as double the diameter of the outer two conductors, making the impedance independent of spacing, and giving us a nominal 600Ω feed point.

Using 75Ω coax into a 4:1 balun gives us only 300Ω, so a ¼λ section of about 450Ω line (slopped together in a hurry using approximate measurements) acted as an impedance transformer.

This antenna was constructed for 20m so that the matching section wouldn't have to be too long and because we had about that much physical room available between the supports. Only one afternoon's work, and up it went! This antenna stayed in service about a year and gave excellent results. At times, depending on conditions, it was possible to make contacts impossible to hear on the beam. The nicest feature was the extremely good bandwidth – it was possible to cover the entire 20m phone band without the


ANY REASONABLE EQUAL SPACING BETWEEN CONDUCTORS
CENTER CONDUCTOR = DOUBLE DIAMETER OF OUTSIDE CONDUCTORS
600Ω BALANCED FEED

SWR going over 1.5:1. No adjustment of tuning or loading was necessary once the rig was tuned near the center of the band.

Changes always get made, and this antenna is now rolled up and somewhere in the corner of the garage. The results were most gratifying, and I am now building another system using two of these in a phased array.

The advantages of the 3-wire dipole over the ordinary dipole are added bandwidth without impedance change, better performance in not having to compensate tuning or bading when QSYing, and apparently some improvement in signal strength. It was suggested that since there is more wire in the air, there is more capture of received signals and correspondingly greater strength in the receiver. The same would appear to be true on transmit.

The disadvantages are the higher feed point impedance, making it necessary to do some sort of matching, the added weight with more wire and spacers, and somewhat greater wind resistance.

The advantages and performance outweighed the disadvantages in this installation – in addition to many stateside contacts, it was possible to work Alaska like they were down the street, Siberia, Europe and Latin America.

When you want to spend an afternoon on a project, remember the 3-wire dipole.

. . . **WA6CPP/WA7PEI**

E. M. Wagner G3BID
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London N.W. 3
England

LOADING UP FOR OPTIMUM ANODE CURRENT OR RF OUTPUT

Before and shortly after World War II, most rigs were home brew and operated CW or AM. These rigs usually consisted of a series of separate pieces of appartus: a transmitter, a receiver, an antenna change over relay, a control panel, a send/receive switch, and usually an antenna ammeter.

In those days one often looked at the antenna ammeter when loading up. It was, of course, clear that the antenna ammeter was only a comparative indication, and that if any change was made between the antenna ammeter and the antenna itself, such as the installation of an antenna tuning unit, this would materially change the reading on the antenna ammeter.

So, many of us gradually lost interest in the antenna ammeter, and in many installations it disappeared completely.

Tuning up was then done by observing the final anode current meter. The rig was loaded up to a specific anode current. This was true when many of us had our antennas link-coupled to the tank circuit.

The anode current meter continued to be the most important indication in loading up the final when we went over to pi-output circuits and for some time the anode milliammeter was the only means of loading up the final in commercially built rigs.

Some people used field strength meters to check their loading. Then came some wattmeters which could be left in circuit during operation. Also several manufacturers such as Drake and Swan included comparative rf output meters.

Comparing the loading by the reference to the rf output meter with loading by the anode current meter, shows clearly that these two methods are not always the same. If all rigs "looked into" an entirely non reactive load of 50Ω the difference might not exist. But in practice, especially with mobile antennas, it is rarely possible to make the antenna show a non reactive load of 50Ω at all frequencies in the amateur bands.

Many amateurs still tune up for optimum loading (within the prescribed limits, of course) of the anode milliammeter.

Tests which I have made with several different types of transmitters and transceivers, including KW Victory, Drake TR3 and TR4, all show that loading up by reference to the rf output gives far better results. Often a noticeably lower anode current can produce a greater rf output indication and reports from the distant stations indicate that this is the better signal and not the signal obtained by the best loading according to the anode current meter.

. . . G3BID

Earle H. Eaton
851 Springfield Ave. 8D
Summit NJ 07901

A Digital Interlaced Sync Generator for Closed Circuit TV

Unlike the usual interlaced sync generators which employ multivibrator, blocking oscillator, or unijunction stairstep divider circuits, this digital design provides stable operation at low cost, and with few components. Only the master oscillator frequency and output pulse periods need be adjusted. The total cost should not exceed $20

Circuit Operation

Integrated circuit IC-1 is an astable multivibrator which operates as a 3.5 kHz master oscillator. IC-2 through IC-4 are modulo-N dividers which divide the master oscillator frequency by 525, producing 60 Hz vertical sync pulses. IC-6A permits adjustment of the vertical sync pulse period.

IC-5 is a modulo-N divider which halves the master oscillator frequency producing 15.75 kHz horizontal sync pulses. IC-6B permits adjustment of the horizontal sync pulse period. Note that both positive and negative pulses are available at the outputs of IC-6.

Adjustments

Before applying power to the circuit, adjust resistors R1, R3, and R4 for their approximate mid-position setting. Apply power and check pin 6 of IC-1 with a scope. Adjust R1 for a square wave with a total period of 32 microseconds. (Since R2 is a fixed resistor, the positive and negative excursions of the square wave may be slightly asymmetrical.)

Connect a scope to pin 6 of IC-6A and adjust R3 for the desired pulse period (1300 microseconds standard).

Finally, connect the scope to pin 10 of IC-6B, and adjust R4 for the desired pulse period (7 microseconds standard). This completes the generator adjustments. Any slight drift of the master oscillator will have little effect on the interlace.

. . .Eaton

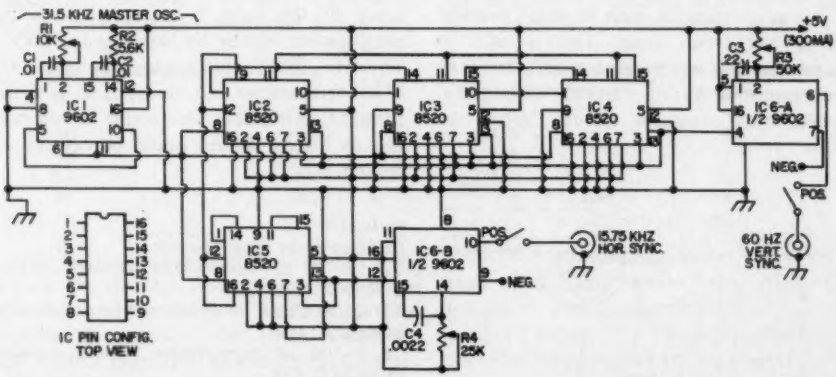

Fig. 1. Schematic of the digital interlaced sync generator. R2 is 5.6K ½W 5%; potentiometers are miniature and capacitors are mylar. IC-1 and 6, 9602PC, are available from Schweber Electronics, Syosset NY, $3.00 each plus postage. IC-2 through 5, DM8520, are available from JTM Associates, P.O. Box 843, Manchester MO 63011, $1.90 each plus postage or from Babylon Electronics, P.O. Box J, Carmichael CA 95608, $2.00 each plus postage.

Walter C. Powis K3SCW/AFA3SCW
239 N. Hammonds Ferry Road
Linthicum Heights MD 21090

Notes On Converting The AC/DC For WWV

By the addition of a few simple parts, the receiver in the article, "Converting the AC/DC for WWV" by W3JJU, Oct. 1971, *73* can be made selectable from 10 MHz to 15 MHz. All of the coil dimensions remain the same as in the original article and the rf and oscillator sections are retuned by switching tuning capacitors. From the circuit in Fig. 1, it can be seen that some of the parts values have been changed. Capacitor C5 is a small variable with its shaft brought out to the front panel. This is used to compensate for any oscillator drift that may be encountered during warmup. During calibration, this capacitor should be in the center of its rotation. It should be noted that the 15 MHz position has to be calibrated first with C6 to tune the oscillator, and C3 to peak the rf amplifier. Then switch S1 to the 10 MHz position and tune C4 and C2 respectively.

Because of the propagation changes during the day, it is an asset to be able to receive more than one WWV transmitting frequency. Since I work the 20 meter band most of the time, I can usually tell how propagation will be by listening to WWV on 15 MHz. With a little more thought, other WWV frequencies can be selected. It is even thought that if the cost could be tolerated, the oscillator section could be crystal controlled.

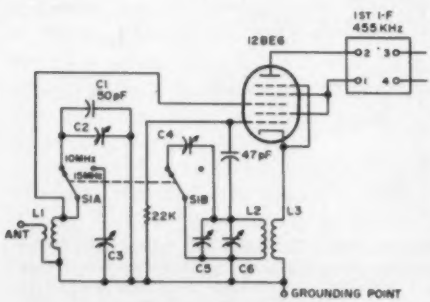

Fig. 1. Schematic diagram.

Parts List
C1 50 pF silver mica capacitor.
C2 1.5–10 pF compression trimmer capacitor, ELMENCO 402
C3, C6 7–60 pF compression trimmer capacitor, ELMENCO 404
C4 7–100 pF compression trimmer capacitor, ELMENCO 423
C5 1.8–8.7 pF miniature variable capacitor, E.F. JOHNSON 167-104-1
S1 DPDT selector switch

. . . K3SCW/AFA3SCW

Bill Welsh W6DDB
2814 Empire Avenue
Burbank, CA 91504

ELECTRIC EXTENSION CORDS

It has been said that "familiarity breeds contempt" and also that "a little knowledge is a dangerous thing." Both seem to combine to cause hams to use extension cords improperly. We're familiar with wire and we know about voltage drops. Unfortunately, we tend to push extension cords past their limits, and this can cause trouble.

This article contains some information which is useful to anyone who uses an extension cord – and that takes in almost everyone! If you are one of the few wise ones who use extension cords properly, you are to be congratulated; even if this is the case, you'll be sure to know others who can benefit from reading this article.

Wire sizes and gauge numbers run opposite to each other. The larger diameter wires have smaller gauge numbers, and vice-versa. This article is primarily concerned with 8 thru 18 gauge wires and Table I lists their diameters in mils. Remember that 1 mil is 1/1000 of an inch.

Wire has a known dc resistance per unit length and this value is normally listed in Ω per one thousand feet. Basically, larger wire has less resistance per foot than smaller wire because the electron flow has a larger cross-sectional area (pipeline) to pass thru. As an example, 8 gauge (0.1285 inch diameter) wire has less than 1/10 as much dc resistance as 18 gauge (0.0403 inch diameter) wire.

Table I. Wire Gauges and Diameters

Gauge Numbers	Diameter (Mils)
8	128.5
10	101.9
12	80.8
14	64.1
16	50.8
18	40.3

If you intend to use an extension cord, you'll have to determine the total current it will have to handle by adding the current requirements of each device you plan to plug into the cord. Amperage (current) requirements are frequently shown on equipment and in associated instructions. If just the power (watts) is shown, divide it by house voltage (115) to determine the amperage requirement. As an example, a 230 watt device draws two amperes from a 115 volt input power line. If you're going to feed a motor which doesn't show amperage or power data, Table II can be used to estimate normal current requirements of motors rated at 1/6 to 1 full horsepower.

Use the shortest extension cord that will comfortably reach between the available power outlet and the electrical device which temporarily needs to be powered at some remote point. Line loss causes the cord to heat up. If the loss is excessive and if it is sustained continuously for a long time, the overheated cord could damage materials it touches and could start a fire. Regardless of how short an extension is required, use one which has large enough wire to handle the total current requirement. If you have to use the same electrical device at a location which is further from the power source (wall socket), it is usually necessary to switch to a cord with larger wires. Table III lists the gauges of wires required in extension cords used to supply 2 – 20 amperes of current 25–100 feet from the power source.

Table II. Amperage Requirements of Motors.

Horsepower Rating	Amperes
1/6	4.4
1/4	5.8
1/3	7.2
1/2	9.8
3/4	13.8
1	16.0

Do not use a 2 – wire extension cord outside or in any damp inside area. Since 1 January 1970, the Underwriters Laboratories have required 3–wire cords for these applications. When using a 3–wire to 2 wire

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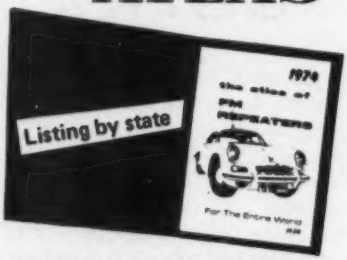

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Table III. Wire Gauges, Extension Cord Lengths, and Current Requirements.

115V ac extension cord length, in feet.

TOTAL AMPERES	25	50	75	100
20	10	10	8	8
18	12	10	10	8
16	12	12	10	10
14	12	12	12	10
12	14	12	12	12
10	14	14	12	12
8	16	14	14	12
6	16	16	14	14
4	18	16	16	14
2	18	18	16	16

adapter to connect a 3 wire extension cord to a normal 2 wire home power connector, make sure to attach the green grounding lead (on the adapter) under a screw head on the power outlet cover; don t leave it hanging loose!

If you are going to use an extension cord in an area where it could become covered with water, oil, or grease, select a cord which has an outside protective insulation which is resistant to these substances.

Most of the cheap extension cords carried in markets can't safely handle more than six amperes. If a blue UL tag is attached, it will list the amperage, voltage, and wattage ratings of the extension cord. The connectors, of course, usually are rated above the capability of the cords they are attached to, so one can't assume that the connector ratings apply to the entire extension cord.

It is important to remember that extension cords are just a temporary means of supplying electrical power to equipment. Don't tape or staple an extension cord in place, because that would be using it as semi-permanent wiring. If you find yourself about to do this type of thing, please reconsider and have permanent wiring added instead. Brightly colored extension cords (yellow, red, etc.) serve to remind one that a temporary extension cord is being used. The white and brown cords blend in too well to be noticed.

Put your knowledge to work to minimize risks associated with extension cords. Carefully select the proper cord to serve as temporary wiring in each application. Pass the word along to your relatives and friends. Extension cords don't cause troubles, but their incorrect uses do.

. . .W6DDB

Hugh Aitken WA1FBE
85 Dana Street
Amherst MA

Longer Tube Life With The NCX-5

Would you like to get more power out of your National NCX-5 transceiver? It's not difficult, now that 6LQ6/6JE6 TV sweep tubes are available for use in the final amplifier. Write to the National Radio Company in Melrose, Massachusetts, and they'll send you a bulletin specifying the minor circuit changes necessary. You have to change the bias resistor (R-36) to about 68K, substitute larger plate caps, and modify the power supply so as to give between 950 and 1000 volts on the high voltage side under load and 300 volts on the lower voltage side. Screen voltage should be no more than 200V. Tune for 400 mA at resonance and you should be able to get between 400 and 500W PEP input or about 275W output. Better keep a fan or blower on the 6JE6's, though, while you're getting everything set up, or you may lose your first pair of tubes.

The National company doesn't recommend this modification, but it's a simple one to make. The question is, is it worth while? Is the extra power worth the trouble? Doubling power is only a 3 dB gain, or one-half an S-unit. If you're already running 200W input, the only place to go is to a "full gallon" if you really want to make a difference. Or maybe your time and money would be better spent improving your antenna.

When I put 6JE6A's in the final of my NCX-5, my purpose was not higher power but longer tube life. My rig first emerged from its carton with 6JB6's in the final. I operate CW almost exclusively, and that 50 to 75% duty cycle was rough going for a rig designed primarily for single sideband. Frequent tube replacement was costly and a nuisance – doubly so because of the necessity for securing a balanced pair. Reduced loading of the final was definitely not the answer to this problem; underloading meant excessive screen current and shorter, not longer, life.

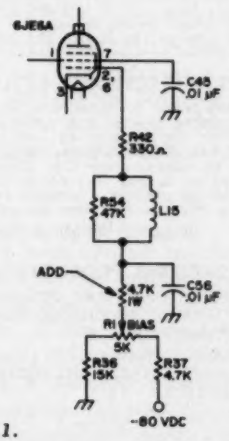

Fig. 1.

Availability of 6JE6's offered a way out of this difficulty, but not until after an educationsal QSO with Steve Lawrence WB6RSE, then a senior at U.C.L.A., and some subsequent correspondence did I get the minor circuit modifications figured out. You have to modify the bias circuit a little,

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6 meter	Single	25 dB	2 dB	$15.50	$18.50
2 meter	Single	20 dB	2.5 dB	$15.50	$18.50
2 meter	Double	40 dB	2.5 dB	$30.50	$36.50
220 MHz	Single	17 dB	2.5 dB	$15.50	$18.50
220 MHz	Double	35 dB	2.5 dB	$30.50	$36.50

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but adding a 4.7K resistor between R-1, the bias adjustment potentiometer, and R-54 will take care of that in most cases (Fig. 1). The essential change is in the screen supply. Here you have to provide 150V *regulated* on transmit, instead of the approximately 250V the old 6JB6's used. Add a 3K 10W resistor to the screen supply and regulate it with a 1N1812A zener, and you've got it (Fig. 2).

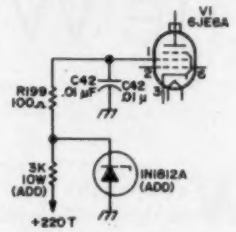

Fig. 2.

The zener mounts very easily by slightly enlarging one of the ventilating slots around the final tube sockets, and can be used as a tiepoint for the rest of the rewiring. Clip the 220T side of R-199, connect it to the zener, and add the 3K resistor between the zener and the former 220T tiepoint. This should do it; if your idling current is still too high, adjust the values of R-36 and R-37 until you get the proper reading (50 to 60 mA).

You will probably have to retune some of the driver coils (L-1 through L-5). Carefully peak the "exciter tune" control first on each band, and then tune the appropriate driver coil slug with a plastic alignment tool through the holes in the enclosure. Adjustment of L-6 through L-10 is not necessary.

Of course you can always, if you like, use 6JE6C's, and step up your plate voltage and current to get between 400 and 500W input to the final, but what's the point? Leave your power supply unmodified, make the minor changes in bias and screen supplies outlined above, and with 6JE6A's in the final you can forget about short tube life – and about matched tubes as well. These bottles will take a tremendous amount of abuse, and they seem to last forever. If you operate CW, own an NCX-5, and like tubes that won't quit, give this simple modification a try.

...WA1FBE

Joe Kasser G3ZCZ/W8
19519 Cranbrook Drive, Apt. 216
Detroit MI 48221

Apartment Dweller's ANTENNA SYSTEM

The basic requirements for an apartment dweller's antenna system are 1) the antenna shall put out a good signal, i.e. if a station can be heard he can usually be worked, and 2) the antenna shall be as inconspicuous as possible so that neighbors and your landlord do not object, particularly where the apartment lease forbids antenna installations.

System Testing

The antenna is tested during a period of high activity on the various bands – during a contest. The contest period is chosen so that reports from a large number of stations can be obtained in a relatively short period of time. Note that the failure of a station to respond to a call is a valid "negative" report.

The invisibility of the antenna is tested by usage. It is only visible during actual operating periods. If at those times it is inconspicuous, then no complaints will result. If after a month or so no complaints have been received, the test is successful.

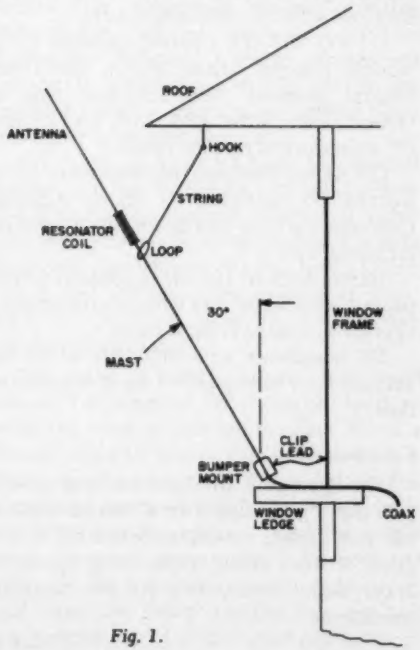

Fig. 1.

System Description

The antenna used is a Hustler mobile whip, operated out of an apartment window at about 25 ft above ground as shown in the sketch. This antenna system was chosen in preference to others because it was easily collapsible and did not fall down under the weight of ice or due to the effects of winds or large trucks, as did earlier long thin-wire arrays.

Setting Up

Attach a hook or other fastening element to the wall or roof outside the building above the window. If a convenient tie point is available, it may of course be used. A piece of string is tied to the hook and a loop about 3 in. in diameter is tied in the other end of the string. The mast is screwed onto the bumper mount and laid to one side. The resonator element is passed through the loop, then screwed to the mast. The antenna is then pushed out of the window and the bumper mount placed on the windowsill. The mast is supported by the string. The window is then closed, wedging the antenna in place.

The first time the antenna is used, the length of the whip is adjusted for minimum

HOT NEWS! for hams...

The 73 HOTLINE is published every other Friday. This newsletter will cover all the up-to-the-minute happenings in amateur radio... FCC news...new petitions filed...new actions...DXpeditions...new products...propagation flashes...Hamfest Classified ads...job opportunities in the ham field...hamfest and convention news...contest news...all those things hams want right now, not two months later as in the case with a magazine. The 73 HOTLINE will be chock full of last minute news since it will be in the mail just a few hours after the deadline closes.

HOTLINE will be mailed to all subscribers for $8 per year by first class mail, marked Rush – Time Value. Our tests have shown that this class of mail seldom arrives later than airmail and often even sooner! HOTLINE will not be a simple typewritten sheet, as some newsletters are, but will be similar to the format of newspapers, with many times the information you might get elsewhere. Use the handy order form below and start getting the news you need to know while it's still news.

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swr in the same way as is done in a mobile installation.

Dismantling the antenna just requires opening the window and pulling it in. The string may be left hanging or tied down to the window frame by catching it between the window and frame when the window is closed. The whole operation of erecting and dismantling the antenna takes only a matter of seconds.

Using the Antenna

In order to keep the antenna inconspicuous, the 75 and 40 meter resonators are used only during the hours of darkness when the whole antenna cannot be seen. By day, the small size of the 15, 20 and 10 meter resonators keeps the antenna inconspicuous.

In use it is possible to alter the effective angle of radiation of the system by varying the length of the string so as to change the angle of the antenna with respect to the vertical position.

Results

Any antenna system is judged by its performance. This one was tested during two contest periods driven by a Yaesu FT 101 barefoot with the following results:

(1) CQ WW DX Contest, October 1971, worked Europe, Africa, North, South and Central America. Did not hear Asia or Oceana. CR6, XX6, 8P6, 9Y4, EA, ZF and CT were worked on 20m alone.

(2) ARRL Sweepstakes, November 1971, worked 63 Sections, 45 States including California on 40m, and all Canadian Sections including VE8.

During both of the above contests several pileups were heard and with careful timing a contact was made in most cases.

No comments or complaints as to the antenna have been received up to the present time.

Conclusions

The apartment dweller's antenna system puts out a good signal on all bands. While it will not replace or outperform a beam or a quad, it does allow transmitting operation under many unfavorable (to the amateur) conditions.

...G3ZCZ/W8

Ms XYL E. A. Gray
8955 East 83rd Street
Raytown MO 64138

MY HAM'S OLD SHACK AND OTHER ABOMINATIONS

What's a nice girl like me doing in a place like this? All this squealing and dah dits and WAØ's and interference and skip is enough to drive a strong woman up the wall and upside down across the ceiling. That's what happens when an unliberated female enters holy wedlock with an (in deep) ham operator . Of course you get used to it as you learn patience, fortitude and create a sense of humor out of hysteria.

I've learned patience so well I can sit calmly – my fingernails actually growing through my clenched fists – with my face deceitfully expressing a serene concern and interest in whether we should go FM, get involved with the repeater, go mobile, buy a crankover or ground plane, etc.

My fortitude has given birth to a kind of patience of Job, as one by one the absolutely-had-to-have transceivers, converters, monitors and rectifiers have decayed into a state of abject obsoleteness. Funny how old furniture and clothes never reach that stage, isn't it? "Lots of wear in it yet," my operator always says.

My sense of humor actually came from the need to laugh or, for crying out loud, go with the boys in the white coats. When a friend comes to dinner, a guess-what-kind-of operator of course, and I ask, "Have you heard that new rock group, the 'Whatchamacallits'?" and he replies, "Yeah, they got great rhythm," then turns to his host and says, "If we could get a bigger transformer and raise the beam another ten feet and convert the . . . " I *need* a sense of humor.

When I ask sweetly, "Did you see the home team beat the tar out of those smart-aleck West Coast bigots?" and he answers, "Man, that new quarterback is sumpin' else," and adds, eyes on fire with excitement, "I think I've got a chance to trade for a new so many meters with a vertical something or other and a matching thingamajig," that's my cue to exit to a quiet place or visit with my English-speaking neighbors.

At night I go to bed by myself or watch ziggagging or growling TV while my operator calls nets, has roundtables, turns rotors, cranks beams or has eye-balls.

From a cute little boy who fastened two tin cans together with a string and yelled into one, "CQ, CQ, CQ," and listened to the imaginary answer, he has lived his life by wire and put me at a tension that is getting ready for a mighty recoil.

Out riding in the beautiful countryside, I cry "Oh, look at that gorgeous . . . " and he hisses, "Be *quiet*, that's old WAØBVD, or is it CWE, who helped me with my first two meter kit. Break, break!" Speaking of "break," I sometimes have an overwhelming desire to break – well, almost anything.

A friend asked, "Why don't you leave him?" Well, I've given it some thought, but I'm an unfortunate orphan with no place to go and too big for adoption and besides I love the ham, who occasionally tunes into my wavelength and generates a little "Switchcraft."

. . .XYL Gray

Bernard Ostrofsky W9HTF
670 N. Tippecanoe St.
Gary IN 46403

AUTOMATIC VERTICAL TRIGGER FOR SSTV

In order to improve the vertical sweep function of a slow scan TV receiver converter[1] the circuit shown in Fig. 1 was constructed. The vertical retrigger consists of Q1, Q2, and Q3. If output is taken from Q3 it would be necessary to reverse connections to the vertical plates of the cathode ray tube due to phase inversion. In order to eliminate the problem so that the oscilloscope used with the SSTV converter could be used without reconversion for normal response the operational amplifier stage was added.

The wave forms shown in Fig. 2 indicate the output from the original vertical sweep circuit (non-recurring) output from Q2 and from the op-amp. The negative bias applied to the inverting input of the op-amp restores the polarity and makes the wave form congruent with the original. The 5000Ω potentiometer is set for a sweep period of 8.5 seconds.

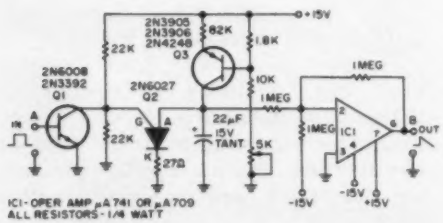

Fig. 1. Automatic vertical trigger circuit.

The original circuitry to be replaced is shown in the broken line box in Fig. 3 along with the points for connecting the input and output.

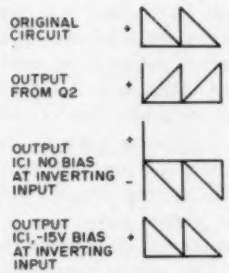

Fig. 2. Vertical output wave forms.

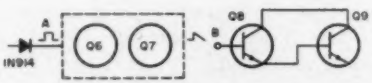

Fig. 3. Circuit replacement points.

The entire unit was built on a 1 x 2.5 in. piece of perforated Vectorboard and mounted directly above the original components.

...W9HTF

1. Briles, Bill and Gervenack, Robert, "Slow-Scan TV Viewing Adaptor for Oscilloscopes" *QST*, June 1970, pp 46–50.

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The New HT-144B Hand Held

2m FM has produced some drastic changes in amateur radio. No longer is the radio amateur limited to communication from his home station or from his car. By using small hand held units on 2m, the amateur can carry on communications from areas which were inaccessable in the past from a communications standpoint. Communication via hand held units is not only useful from a "rag chew" standpoint, but is extremely valuable in times of emergency or disaster. Because of the heavy participation of hams in times of emergency it has become the goal of most amateurs who operate 2m to own some type of hand held equipment. Unfortunately, most of the equipment in this category is somewhat costly being in the $200 and up range and the majority of the HTs are made outside the country. In addition most of the hand held units cannot be maintained by the average ham. In cases where a problem develops, the unit must go back to the factory. Since the units are foreign made, it is difficult to obtain spare parts or vital subassemblies. For these reasons, a large number of 2m operators have put off the purchase of that desirable "HT."

VHF Engineering in Binghamton NY has introduced a low cost hand held kit for 2m which almost every 2m amateur should be able to afford. This kit provides a simple, inexpensive answer to 2m FM operation. The unit is designated the "HT-144B" and is described in detail in this article.

Specifications

The HT-144B is manufactured by VHF Engineering in Binghamton NY and is available in kit form through the manufacturer or through dealers across the nation. The kit is very complete and includes all parts except the nicad batteries and the charger. These items are available as accessories. One set of crystals is included, your choice of 94-94, 52-52, or 34-94.

The transmitter puts out a minimum of 2W on one of four crystal controlled channels at 2m. Modulation is accomplished by using a speaker/mike into an amplifier driving a varactor modulator. Netting

trimmers are provided for all four channels.

The receiver is rated at .35μV for 20dB quieting and puts out .5W of audio, .25 squelch/sensitivity. A pair of crystal filters provides adjacent channel rejection of 60dB.

While four channels may not seem to be enough, most HT owners that I talk to say that four channels are sufficient. But no matter how many channels you have, you wish you had more. By limiting the number of channels to four, the manufacturer has kept the cost of the unit to less than $130. This is a remarkable buy in these times of inflation.

Construction

The HT-144B consists of a main PC board on which all components are mounted and a tiny PC board for the crystals and the crystal switch. The main PC board is made of epoxy glass and has the parts layout silk screened on the top. By using a silk screened board, the manufacturer has simplified parts placement and the overall construction of the unit. Parts layout is good and not crowded.

The case is made of black, wrinkle-finish aluminum and is very rugged. The case is large enough for the boards and the batteries and has a considerable amount of room left over to house PL tone encoders and the like. The outside of the case is smooth and has enough area to hold a small touch tone pad. There is a jack on the top for use with the optional battery charger. The HT-144B comes with a telescoping antenna. However, an external antenna or a stubby flexible antenna may be used by mounting a BNC connector in the 95mm (3/8") hole provided.

The HT-144B is very easy to build and can be constructed by anyone who has had minimal experience building kits or ham equipment. This kit, however, is not for the arm chair amateur as it requires some knowledge of schematic diagrams and the ability to solder with a low wattage soldering iron. The only tools needed are a soldering iron (26W preferably), solder, screw drivers, pliers and wire cutters. Construction time for the average ham should run about 7 to 12 hours. The instruction manual is clear and concise.

Theory of Operation

The transmitter consists of 7 transistors in a unique design. A speaker/mike drives a 4 transistor cascaded amplifier which in turn modulates a crystal oscillator with a varactor diode giving true FM. The oscillator uses 18MHz crystals and quadruples to 72MHz. The second stage doubles to 144MHz and drives the 2N5389 to 2W output. Both the oscillator and driver use the readily available, inexpensive 2N3866. The output stage is somewhat under rated and because of this does not need a heat sink. All stages are optimized to conserve battery current.

The receiver uses a MOSFET front end, 3N204, and has more than enough gain for the first mixer, a 2N5222. The first mixer feeds a pair of high quality 2-pole crystal filters at 10.7MHz. The second mixer is a 4 transistor cascaded limiter/i-f stage feeding a ceramic discriminator at 455MHz. The audio output IC is a readily available MFC6070. The squelch circuit consists of a noise amplifier which amplifies high frequency noise. The presence of noise causes a MPS5172 switch to cut off the MFC6070. The absence of noise, such as when a signal is present, causes the MFC6070 to be turned on. Squelch operation is smooth and reliable with this circuit.

Switching is accomplished with a double-pole double-throw switch mounted on the side of the main PC board. Both antenna and battery voltages are controlled by this switch.

Performance

I built my unit without benefit of an instruction manual since I managed to scrounge a pre-release unit so I could write this article. The only problems that I had were one bad solder joint and one misplaced component. These problems were found quickly with the help of a 10MHz scope once the batteries were connected to the unit. In practice, a scope or other sophisticated tool should not be needed if a little care is taken with component placement and soldering. The PC board has the placement of all components marked clearly, so it is next to impossible to make a mistake unless you rush as I did.

Tune up is very simple. The instructions call for the use of a signal generator to tune up the receiver. I don't think that the signal generator is really necessary, since I found that even in the untuned condition I could copy signals several miles away. So, I tuned my receiver up on the air.

Tuning up the transmitter is also very simple. Merely connect a wattmeter or a light bulb (#47 bulb) to the output connection and tune for maximum output. A voltmeter is useful to help tune some of the coils, but may not be necessary in all cases.

My HT-144B measured 2.2W out on a Bird termiline wattmeter. The meter measured .3μV for 20dB quieting and the squelch opens at .2μV. I have used this rig in the Hartford area for several months now with excellent success. I have owned other HTs in the past and I feel that this unit will equal anything on the market today. The unit meets all advertised specs as far as I can determine. The only complaint that I have is that the transmit audio is slightly bassey, but not to an objectionable degree. This is typical of HTs using a speaker/mike.

Up to 6 kc deviation has been provided showing quite an improvement over the earlier HT-144.

Conclusions

After having built and operated my VHF Engineering HT-144B, I am very pleased and feel that it is a best buy in HTs at this time. You can't even come close for less than $199.00. I do offer a few cautions however. Schematic reading ability is not an absolute requirement for building this kit. However, the ability to properly solder is. You must be able to solder without dropping globs of solder all over the board and without applying too much heat to the components on the board.

After building this HT kit you will have an inexpensive, well performing unit that you can repair yourself. I recommend it highly. ...W1HCI

CRYPTOGRAM

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Joseph A. Kramer WA9DJR
14 East Jackson Blvd.
Chicago IL 60604

TVI FIXIT

Recently I purchased one of those "gizzards in a box" transistorized TV sets for the XYL and paid enough to get that commercial linear. When I stayed on CW I was in the clear but when AM or SSB, that TV tuned as broad as a barn and a high pass filter didn't help. I knew my rig was clean and two black and white sets had no interference. What to do?

I made up a three wire short line cord. Four feet long, to be exact, and covered it with the braid from a piece of coax. The plug I used had a two screw metal clamp and the braid was placed just under the metal ring. Green wire to green plug terminal, white to white, etc. At the other end I attached one of those noise filters that are quite plentiful in surplus, white and black to the input and the braid soldered to the case. I cut the TV cord short (about 9 inches) and soldered it to the output terminals of the filter. The interference filter was attached to one of the back screws that hold the back firm at chassis. Another wire grounded the power supply and the set chassis. While I was at it I put a small fan underneath the cabinet to carry off some of the heat, since I was surprised how hot the wood cabinet was when operating.

No TVI, and what a beautiful picture improvement. Fantastically true colors, a new revelation in color TV. Not to mention a happy XYL, and the OM can operate again!

...WA9DJR

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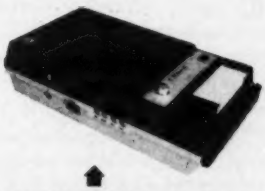

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Features: stereo deck – pause control – CrO_2 bias or normal – automatic stop at end of tape – two VU meters – counter – headphone jack – mike input – line in and out. Great medium price cassette deck – quite adequate for top notch SSTV work – put your records on tape.

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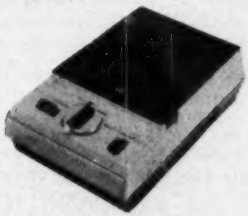

ECONOMY PORTABLE

Features: Rotary control for ease of use with one hand (like in the car) – peak indicator – automatic level circuit for optimum recording level at all times – 117 vac – built in batteries – remote stop-start – mike input – line input – earphone/line output – fine unit for voice or Morse code study – adequate for lo-fi music – excellent bargain at the price. **$23.95**

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FIRST HAM BEEFEATER

O.P.S. Yeoman Warder Reed on the battlements with the antenna stretching 108 feet.

Beefeater Roy Reed is really quite a ham and in fact the real Tower Hamlet. He is better known as Yeoman Warder Reed on duty and G3 LEX off duty to his many friends on the amateur bands all over the world.

When Roy became a Yeoman Warder in June this year, he moved into the Tower with his wife and daughter, becoming the first Radio Amateur at the Tower of London. He has, with the Tower of London's co-operation, been able to erect a 108 foot long antenna behind the battlements in the N.E. side of the Tower.

"It's quite funny on occasions," says Roy. "I call on the wavebands and when I establish contact and tell the receiver where I am calling from he either doesn't believe me or thinks I'm mad and closes down. There was one instance when we made a link between 4 hams all named Roy, so I was immediately named Raven Roy for identification!"

GRR GRRREEN

PHILADELPHIA ATTROCITY

A letter from W3ZWR/2 tells of a most frustrating situation. I gather from his letter that his mother-in-law was somehow involved in notifying the police that Gene's car was an abandoned car. The police came to tow it away, despite efforts of his wife to stop them. Gene is crippled, so there wasn't much he could do. The police never even tried to verify the complaint about the abandoned car.

The car contained reference books, hundreds of tubes, some television sets, some FM equipment, both base and mobile rigs, plus a good deal of surplus gear — all of which was apparently stripped after the car was seized by the police. It also appears that Gene is just plain out of luck on collecting anything from the city for the outrage. It would seem that it is about time for Gene to consult the Legal Aid Society and find out what his rights really are.

THINGS LOOKING UP

The barrage of newly proposed changes in FCC regs seems to indicate that there are indeed better days ahead for us in amateur radio. The restrictiveness which was stifling us just a few months ago has given away to a policy of allowing amateur radio to grow. Since this change in basic attitude has taken place under Chairman Wiley, it may be that we all owe him a debt of gratitude.

The virtual elimination of the logging requirements, the purpose of which had been lost somewhere in history, is a good sample. I talked with the Amateur Division about this a couple years ago and asked why we needed to keep logs in such detail. The answer seemed to be, "Because that's the way it's always been." I wrote and editorial on the subject.

Most of the seriously restricting repeater rules have now been amended or are about to be amended, as promised us by Chairman Wiley back in January when we held the hearing before the Commissioners. This has turned things around for the FM boys and repeaters are going in at a faster clip than ever before. FM was, even then, the largest single interest in amateur radio, with about 40% of the active amateurs participating — now this is heading higher and the day may come when almost every active amateur has a VHF transceiver in his car and an HT on his hip at hamfests.

The repeater growth here in New Hampshire is rather typical, I think. It wasn't very many years ago that there was a 34/94 repeater in Concord (the state capitol) and that was it. A couple years ago we had five repeaters. Today we have nine on the air and three more due on any day. When you consider that there are only about 1550 licensed amateurs in New Hampshire all told, a fair percentage of them must be active on FM to keep twelve repeaters in action.

Unless Dean Birch ends up with more power than it appears he will with the collapse of the Nixon administration, it is possible that amateurs will retain the 220 MHz band. Should this come about, it now seems likely that my proposal for a code-free beginners ticket will materialize which will permit operation in that band. The ARRL is very much in favor of this move (which goes to prove something, probably) and has their directors out talking it up at clubs.

Oddly enough, I view the code-free license with less than total confidence. There is no question that we need more amateurs and need them desperately — and there is little question that the opening of a code-free band would become popular. My reticence has to do with the results of my recently devised code tapes. The fact is that teaching methods have come a long, long way in the last generation and with the newest of techniques it is so incredibly simple to learn the code that a ten year old can do it in about one hour — and that's complete with 26 letters, ten numbers and punctuation!

My five word-per-minute beginning one hour tape cassette has been bringing in letters from all around the world saying how easy it is to learn the code now that there is a tape like this. Kids of eight and nine have been mastering the code with one playing of the 60-minute tape! This leads me to wonder just what all the fuss is about learning the code a 5-per. It now appears that the major difficulty with learning the code in the past has been the lack of any really good system for doing it. Just as the 73 license study manuals broke the back of the theory exams, the 73 code tapes have mercifully eliminated the problem of learning the code.

To digress for a moment. There are four tapes available — with the first being for someone who does not know the code at all. In one hour most people are able to recognize all of the characters they will need to pass the exam for Novice or Tech. The next step is our nasty six word per minute "Back Breaker." This one, using the FCC standards of timing for both words and individual characters (as far as I know this is the *only* tape ever made available which adheres to these standards) and thus properly prepares you to face the FCC. The BB-6 tape gives you one hour of unmemorizable code groups for practice and, when you can handle it, you can walk confidently into any FCC office anywhere and know that you will pass their test easily.

The 14-per tape gets you ready for the General and Advanced tests and has that margin built in which permits you to relax when the FCC tapes start grinding. Ditto the 21-per tape.

Yes, I know all of the arguments against code, and some you haven't even thought of yet. And I know all of the arguments for retaining the code as part of the amateur license (and there aren't very many legitimate reasons). My own reaction to the whole situation is to be in favor of maintaining the 5 wpm entrance exam to the hobby and then depend upon the enthusiasm of CW operators to encourage higher speeds.

Since I have recently made up a tape of the Novice theory I am relatively familiar with the requirements along that line — and they are not much more than one gets in high school physics. It thus seems to me that if we settled upon a beginning license which had the requirements of the present Novice ticket, but which permitted phone operation in the 220 MHz band, we might end up with a good workable result. Licensees would have had to study a little and learn the basics of theory and code, which hopefully might separate them from the CB buy-your-license (or why-buy-your-license?) crowd.

There are over 5000 ham clubs around the country and, with a little encouragement from the ARRL, I suspect that a great many of them could be gotten to set up Novice study classes. As Novices they would be able to work phone in the 220 band and CW on the lower bands, thus getting both sides of amateur radio. Well, it's a thought.

73 GROWING, TOO

About the only thing really hurting in amateur radio today is DX, and even that is not in too bad shape. The dearth of sunspots has made it a bit more difficult to work 350 countries, but somehow new ones keep turning up.

Now that the IRS hassle seems to be over and a couple of very productive people have been added to the staff, we're looking forward to a great fall and winter. I have a bit more time to help with the editing and this may

make the magazine a little more fun to read. We're looking hard for people who would like to represent 73 Magazine at hamfests and other ham events to sell subscriptions, books, study guides and tapes. It's a nice way to make some money and get to meet everyone. If your club is going to have any sort of event, be sure to get in touch with us and set up a 73 booth – it *pays*.

WAYNE TAKES PICTURES

Henry W1AUY, motorcycle number 73, stopped by the 73 offices for a visit. Henry can be worked via WR1ABU in Concord NH most any day.

Ray K1IGF, one of the very active repeater owners of New England, particularly on 450 MHz. You'll hear Ray on 6m a lot too, as well as 146.52 via a very effective remote base setup.

Kathy WB8LOZ and Sue WB8OXB snapped at the 73 booth at Dayton. The next time some CBers starts giving you that stuff about the code being just too much for him, pull out this picture and ask him to explain how come these two nice little girls can cut the mustard when he can't.

Here is W1EFF of the Northern Berkshire Amateur Repeater Club – picture taken at one of the 73 Magazine FM Symposiums.

John K1HZN.

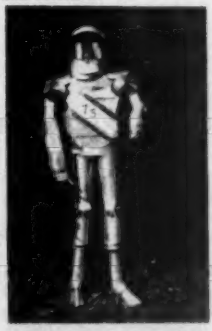
Lew McCoy W1ICP, secret 73 double agent operating out of ARRL HQ.

Ed Clegg W2LOY, designer and father of all those nice Clegg rigs down through the years. Ed has been one of the most enthusiastic supporters of ham use of the 220 MHz band and has put the Clegg company on the line with 220 transceivers and a 220 repeater.

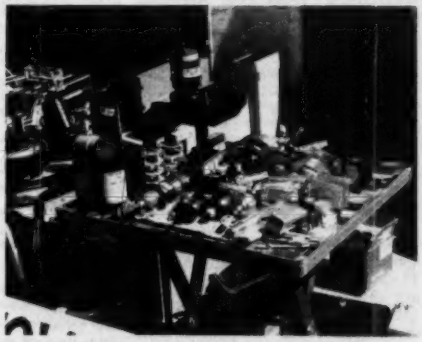
WA1EQN, Nick, of the WR1ABT, New Haven.

Tony, WA1OND, also of WR1ABT in New Haven.

Dick K1ABR, one of the earliest repeater pioneers of Rhode Island. 10-70 continues there with WR1ABW.



K1REC sent in this shot of a five foot aluminum knight in armor. Lord knows why he built it, but it does have a "73" on it, so huzzah for REC.



Some snaps taken at Dayton -- undoubtedly the world's largest flea market. Some people come bringing truck loads of stuff to sell -- some go away taking truck loads of stuff they've bought -- all go away happy.

Digging back, here's Johnny Barrows DL4HU at Bitburg in 1962 when I visited him.

I caught this picture of Ed Pillar W2KPQ at a Long Island auction. I've known Ed since before I got my ticket -- I used to visit him when I was an SWL!

Here's Wayne talking to the Bitburg radio amateurs in 1962 -- not much change in 12 years other than a little less hair and weight.

This one was taken by WA8ZCO on I-75 north of Lima, Ohio! PR for 73 everywhere, if you just keep those eyes peeled.

NEW PRODUCTS

CALCULATOR CLOCK

The Corvus Calculator clock is quite unique in concept. The idea of combining a clock MOS chip with a MOS Calculator Chip appears to be a natural. The calculator provides addition, subtraction, multiplication, square root, division, percentage, reciprocals. The unit displays 10 numerals. The decimal may be set to float or fixed at 2 or 4 places rounded off to the closest digit. The clock chip may be set by a three position switch to display time only, date only, or alternate time displayed for 8 seconds, date displayed for 2 seconds. Clock displays hours, minutes and seconds. The clock will operate as long as the unit is plugged in -- the off switch serves only to blank the display. In the event of power failure the readout is all figure 8's.

For more information write *Tucker Electronics, P.O. Box 1050, Garland, Texas 76040.*

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you need help, let 73 know — don't be bashful — the readers are solid gold and are anxious to help you. If you would like to help, let 73 know about that plus your area of expertise, if any, so we can list you for either general help or as a technical advisor.

The following need some help — can *you* spare some time? Clubs in particular take note.

Charles Zabriskie
295 Meadowbrook Road
Weston MA 02193
617-899-3030

Jerry Wilson
3604 Park Avenue
Covington KY 41015
606-431-2320

Basil W Polinchak, Sr.
14 Martha Lane
Lawrence MA 01843
P O. Box 1202
617-685-3910

Robert M. Gallery
5013 Westport Road
Chevy Chase MD 20015

CONTESTS

RTTY ART CONTEST
Sept. 1 to Oct. 31, 1974

Entries in the contest should be sent to Don Royer WA6PIR, 16387 Mandalay Drive, Encino CA 91316. Send a five-level tape and five prints of each entry — as many entries as you want — winning entries will be published in 73 Magazine. Write Don with SASE for the full set of rules.

CONTEST CALENDAR

Oct
5-6 California QSO Party
5-7 WE Phone & C.W. QSO Party
12-13 VK/2L/Oceania C.W. Contest
12-13 RSGB 21/28 MHz Phone
16-17 YLRL Anniv. C.W. Party

NOTICE

Watch for an update of the WØLMD SSTV Scan Converter in the November issue.

OOPS!

We left the parts list out of K8VIR's article '3000 V DC Power Supply' which appeared on page 69 of the July 1974 issue. It follows below:

BL = Blower, 60 cfm at .6 inch static pressure. Dayton 4C005 or equivalent.

C1 = Triple-section broadcast capacitor or equivalent. 365 pF per section.

C2 = Jennings 10 to 300 pF Vacuum Capacitor, 6 kV or higher rating.

C3 = 1500 pF air variable capacitor. Spacing dependent on tube plate voltage. Air gap approx. 1 mil/100V of plate voltage. B&W 51241 or equivalent.

D1, D2, D3, D4 = 1.5 amp, 1000V PIV

F3 = (Slow Blow) Dependent on blower chosen. My blower required 2A.

J1, J2 = Chassis-mounting coaxial connectors (SO-239).

L1 = Best, 1/8 inch copper tube silver plated. Alternate, No. 10 or 12 copper wire. Approximate data 6 turns 1¼ inch diameter, 1¼ inches long tapped 1¼, 2, 2½, 4 turns. Note: The exact taps are dependent on coil placement, lead length and driver to linear coax length therefore adjust each tap to cover the entire desired band before soldering.

L2 = B&W 850A. Pi-network inductance.

P1 = Elmenco Fused Plug.

Rx = See Text.

R2 = Five, 5.6 ohm ½W carbon resistors in parallel. Use very short leads. Place .01uFd capacitor directly across resistors.

R5 = Surge resistor. 10 ohm 2W. Note: Check dc resistance of your transformer secondary. If it is 10 ohms or higher disregard R5.

RFC1 = (B&W FC 30A) or equivalent.

RFC2 = B&W 800. Note: see text for modification.

RFC3 = RF choke, Ohmite Z-50.

Lf1, Lf2 = Line filter choke, No. 16 copper wire insulated. 20 turns, 3/8 inch diameter close wound. (Place filter, Lf1, Lf2 & feedthru .01 capacitors, inside bottom chassis at point A-C enters.)

S1 A-B = CRL 2551, 60 degree index, single section double pole six-position ceramic rotary switch.

S1 C = Switch on back of B&W 850A.

S2 = SPST Toggle switch.

T1 = 110V primary, 110V sec, 100mA.

T2 = 7.5V C.T. 21A, filament transformer.

TY1 = G.E. Thyrector, 6R5205P4B4

Z1 = 2 turns No. 8 copper wire, ¼ inch diameter. (Silver plated) Shunted by three 130 ohm, 2-watt carbon resistors in parallel.

SATURDAY POST FEATURES

HAM STORY!

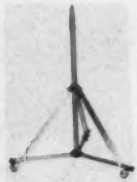
The DXpedition to Gibralter ZB2CS, is the subject of a feature story in the August/September issue of the Post.

For the first time in ages a major general interest magazine is running an article which talks up amateur radio. In this one an American DXer visits Gibralter and tells of his experiences meeting a local ham with whom he has talked for years — and in setting up his ham rig in a hotel and making contacts all around the world.

The article is interesting, too, in its coverage of the interesting aspects of Gibralter. There aren't very many places left where you can stay at one of the better hotels for $5 per day (with a private bath) and eat for under $4 per day.

If you aren't up to buying this copy of the Post to show friends the five page article, at least sneak a substantial look at it the next time you go by a newsstand. One of the benefits to amateur radio if someone could convince the ARRL to hire a PR outfit would be articles like this in many more of the general interest magazines. It wouldn't take very many of these before we had thousands of more amateurs joining our ranks. It takes PR these days to compete with all of the other sports and hobbies — and honestly, do you know of any other hobby that has as much potential for benefit for both the individual and the world as amateur radio?

NEW PRODUCTS



MODEL #TSL TRI-STAND LIGHTPOD

Just introduced is a new and unusual light stand that doubles as a sturdy camera tripod, known as the Tri-Stand Lightpod. When not in use with spots, strobes, or quartz lamps, a camera pan head can be quickly attached converting the entire unit into a rugged camera stand. The camera stand will support most 35mm and 120 size at up to eye level height.

This precision engineered unit made of anodized aluminum will transform from its fully extended height to a portable system in less than a minute. The 3-section column extends from 41 inches to a maximum height of over 9 feet. The famous Safe-Lock clutch collar system locks the column at your desired height. The tripod base is braced with 6 solid aluminum struts which lock into place with the twist of one control knob. Two inch ball bearing caster wheels with toe brakes on each wheel allows optimum mobility with positive anchoring. Gold finished legs and column add glamour to what should prove to be an extremely useful and versatile system. For further information, contact: *Glenn M. Welt, Welt/Safe-Lock, Inc., 2400 West 8th Lane, Hialeah, Florida 33010.*

GUNG HO DXers

Dan Umberger W8ZCQ recently sat down and put the ARRL DX listings in alphabetical order, thereby discovering some interesting facts. The highest country total is a chap with 353 (missing one -- Daimu, whatever that is). If Wrangle Island is counted (no one has submitted that one), the total possible is 355. Thirty ops have worked all of the currently existing countries, so there is plenty of room left at the top.

Dan counted up the number of ops in each call area that made up the 652 stations listed and found them distributed by call area as follows:

1 – 51	.25%	6 – 116	.29%
2 – 103	.31%	7 – 20	.10%
3 – 38	.19%	8 – 63	.22%
4 – 94	.24%	9 – 63	.24%
5 – 60	.23%	0 – 44	.17%

Since the actual number of "registered" DXers in any call area is not really significant in itself, this number has been divided by the number of licenses issued in each call area to indicate the percentage of DXers in each call area. The W2's came out way ahead on this, oddly enough. The W6's make such a fuss about DX that many ops get the idea that almost everyone in California has a "cool" kilowatt and great big beam – and carries around three hundred plus QSL's in his back pocket. And what happened to seven-land?

. . . Wayne

COLLINS ANNOUNCES NEW AMATEUR RADIO OPERATIONS GROUP

Cedar Rapids, Ia., July 9, 1974 – Collins Radio, part of Rockwell International Corporation, is placing increased emphasis on amateur radio activities with the formation of a new amateur radio business operations group.

Appointed manager of the amateur operation is Joe H. Beler W5WY/Ø, who has been with Collins for 14 years in various program management, systems engineering and manufacturing positions. A ham for more than 30 years, Beler holds an extra class license. While serving with the U.S. Air Force, where he attained the rank of Colonel, he was responsible for introducing operational HF SSB to the Strategic Air Command.

Jerry Carter WAØZRW, who has been involved in Collins amateur marketing activities for the past two years, will be marketing manager in the new operation. He has been an active ham for 11 years.

Also joining the new business operation is Arnold Verdow WØLIJ, who will be in charge of product support. A long time Collins employee, Verdow has been active for many years in amateur radio, both with his own station and in activities such as civil defense.

The amateur radio business operation is a part of Collins' Telecommunication Equipment Division based at Cedar Rapids, Iowa.

HEATH 1975 CATALOG OUT

While Heath may be pushing the calendar a little by dating their new catalog 1975, the fact is that it is a whopper and has some interesting new Heathkits featured. This one runs to 80 pages and covers everything they make, including the ham gear, the hi-fi, test equipment, right on up to their $1000 color television set kit!

Some of the new gadgets include a space-age design digital clock/alarm clock, a matching digital clock/day-date unit, a ten watt 2m amplifier for HT's – things like that.

It takes strong willpower to pass up some of the fascinating Heathkits such as the indoor/outdoor digital thermometer, the three band CW transceiver for portable QRP work, and their new high power stereo FM receivers. Heath Company, Dept. 73, Benton Harbor MI 49022.

THINK METRIC!!

The metric system, being inevitable, as must be obvious to everyone by now, it behooves us all to learn and relearn a few things. For instance, re-gear your thinking to the following:

A miss is as good as 1.609 kilometers.

Take it with a decigram of salt.

He was beaten within 2.54 centimeters of his life.

28.350 grams of prevention are worth 453.59237 grams of cure.

Peter Piper picked 8.81 liters of pickled peppers.

And how about a girl who measures .9144, .6604, .9144??

CCRC

Cont'd from p.5

LETTERS

DX STATIONS

As a fellow amateur I thought you might be interested in an incident that happened to me recently. It was a fairly fine day except for the band conditions. About 2100 GMT I heard a 14JJV calling CQ DX on about 14.204. A perfectly clear frequency since everyone was up the band calling the KP6 station. I gave the 14 station a good clear slow call. Upon signing the initial call to him I was told in the rudest way that the frequency was in use. I was sworn at in the worst way. Not one station identified itself. This went on for about three minutes. The language was the kind you might use on a football field as a line backer. Then a W5 very nicely and politely asked me to QSY, that the frequency was in use for some time and he understood that I did not hear the KP6 that supposedly was near by. What people will do to satisfy their ego to work a DX station.

This was not the end of it. Several minutes later I received three obscene phone calls from amateurs in the area. Two of them I did not recognize their voices. But one of them did identify himself. He is a member of the Northern Illinois DX Association. I was sworn at, cussed out, and threatened! His language was worse than what a linebacker would use on the football field. He was one of the guys that cussed me out on 14.204. Most of the other guys were members of the N.I.D.X.A. also. Above all, Gary said that all the DX cards I get at the ARRL 9th region QSL bureau will be TORN UP and then BURNED! He also said that I will never get another card from the bureau again as long as I live. I forgot to say that the ARRL 9th QSL bureau is run by the N.I.D.X.A. and I know that one of the guys cussed me out that day. He was the one that gets all the cards and then distributes them to the letter call managers.

SST T-1 RANDOM WIRE ANTENNA TUNER

All band operation (80-10 meters) with most any random length wire. 200 watt power capability. Ideal for portable or home operation. A must for Field Day. Size 2 x 4½ x 2-3/8. Built-in neon tune-up indicator. Guaranteed for 90 days.

COMPACT - EASY TO USE

● ● ● only $24.94

POSTPAID (ADD SALES TAX IN CALIF.)

SST Electronics, P.O. Box 1, Lawndale CA 90260

How does the possibility of going to hamfests, or any gathering of hams and making over $100 sound to you? For more information on becoming a local representative for 73 Magazine, write

Director of Marketing
73 MAGAZINE
Peterborough NH 03458

My main concern Wayne, is how the ARRL can entrust a very responsible type of service to such irresponsible people. I know I had quite a lot of cards at the bureau. But what about the 30,000 other amateurs in this region that entrust all their cards to these people? Any one of their cards may be tossed at any time. Especially if they don't like you.

I guess you get the general idea of the story. You can throw this away, publish it or anything really. But I would like to hear your comments if you would please.

Michael A. Krzystyniak (Smith) WB9IJV
412 Lincoln Street
Downers Grove IL 60515

LOG KEEPING

Good evening, Gents. In response to a request from Paul WA5IAT, I called the office of Prose Walker at the Amateur Division of the FCC today. Mr. Walker was on travel, so I talked with one of the other gents there about the new log keeping regulations. Before this phone call, from what I had heard and read, I had the impression that if one placed a calendar in the shack and circled the date of every day he operated, that would suffice for a log under the new regulations. When I related this to the FCC rep, he said that even that interpretation was too strict. I will convey to each of you what I was told today. I can not serve, of course, as the final authority for such, but I can see little chance of misinterpretation of what he told me.

Fixed and Portable Operations:

You are required to log only the date you place the station in operation, and the date you take it out of operation. You should also log the dates of the beginning and end of any long periods of inactivity. In addition, this log should contain the call sign and signature of the licensee "or" a copy of the station license.

Mobile Operation:

There are no log requirements whatsoever for such operation with the exception of "third party" requirements below.

Exceptions:

1. You must still log all "third party" traffic. This also applies to mobile operations!

2. You must still have visitors sign the log and enter their call sign. I did not get a complete explanation of this as to the detail of the log in this case. His words were "you must log the date and time periods of visitors with call sign and signature."

3. For remote control set-ups like repeaters where you have more than one controlling station, you must log the date and times the control began and ceased (each operator must log this for his control period).

That's the extent of what I learned today.

de Bob K4EID

RANJIT KAUR
GURBUX SINGH

I hope this letter finds you in the best of health. I am well and wish you the same. I don't know if you remember me, but maybe the following will refresh you. I am the eldest son of Tara Singh XZ2KN of Burma.

When you were in Rangoon, I had asked for a pair of golf shoes and some badminton gut and you had sent it thru Dr. Charan Singh, 9V1NR of Singapore. At that time, I was trying to get a visa as an immigrant to USA. The official Red Tape was stalling and to make matters worse, I was taken into protective custody by the Government of Burma on 12th July 1972 and released on 17th October 1973. I left Burma by air for Bangkok the same day and the next day went to Singapore. I was happy to get out of Burma and as I had no acquaintances in Singapore, my father told me to look up 9V1NR and I stayed with his family while I worked from scratch to acquire my visa to USA.

Dr. Cnaran's daughter, Ranjit, and I took a liking to each other (frequency response?) and with our parents blessings, we were married on 10th February 1974 at this residence. I left for the States exactly a month later. I have sponsored Ranjit and she will get here by the end of the month. Here is one instance where amateur radio has brought two families together. And believe me, I thank you for it as you were instrumental in introducing a fellow ham from Singapore to my father. I did not even know that he had a daughter, Hi! I am enclosing a picture of us taken on our wedding day. I am working as a technician in Springfield for Ford and have rented an apartment in Rochester, Illinois. My father thinks that our marriage would be good publicity for Hams all over the world.

My best wishes to you and hope to hear from you soon.

Gurbux Singh
Rochester IL 62563

MURPHY'S LAW

AS IT APPLIES TO SYNTHESIZERS

General Engineering

1. Any idea to make it better will be preceded by someone else a week earlier.

2. The more simple a design change appears, the further its influence will extend.

Specifications

1. In specifications, Murphy's Law supercedes ohm's.

2. For anybody's cost estimate, your cost will exceed the estimate by a factor of 3.

Building and Wiring

1. Any wire cut to length will be too short.

2. Identical units tested under identical conditions will not be identical in the field.

3. The availability of a component is inversely proportional to the need for that component.

4. If you need components, you will be able to get n-1 parts.

5. A dropped tool will land where it can do the most damage. (Also known as the law of selective gravitation.)

6. Interchangeable parts won't.

7. If the first one works, subsequent units will malfunction.

8. The most delicate component will drop.

9. If a circuit can't fail, it will.

10. A transistor protected by a fast-acting fuse will protect the fuse by blowing first.

11. A self-starting oscillator won't.

12. A crystal oscillator will oscillate at the wrong frequency — if it oscillates.

13. An NPN transistor will be a PNP.

14. If an obviously defective component is replaced in a synthesizer with an intermittent fault, the fault will reappear after the unit is buttoned up.

About the author:

Mr. Edsel Murphy is a victim of his own Laws. Destined for a place in the engineering Hall of Fame, something went wrong.

In fact, the Law first came to him in all its simplicity when his bride-to-be informed him of the impending birth of an heir to the family fortunes. (Reference EEE, Vol 15, No. 8 Aug. 1968 by D.L. Klipstein)

Submitted by Leo WA1HSO

Submitted by:
Michael Kresila
Box 57
Marion OH 43302

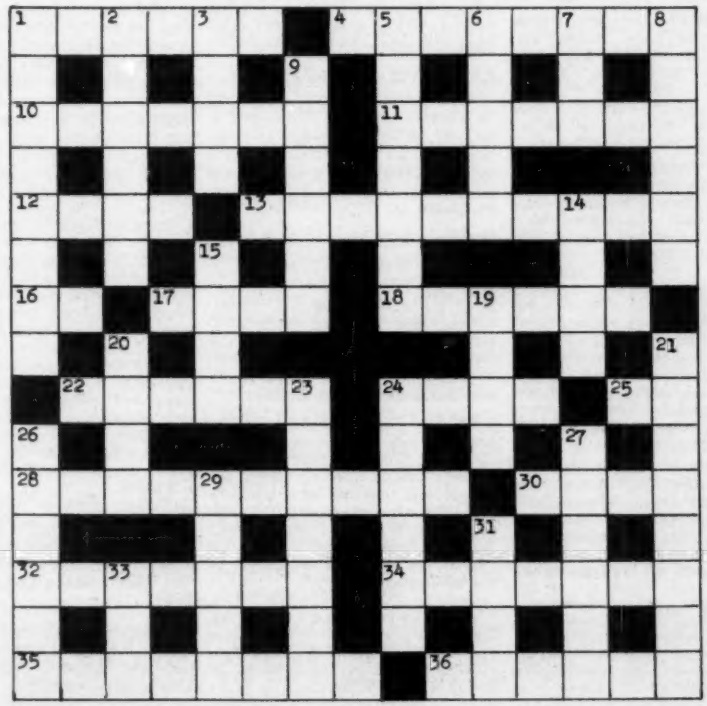
PUZZLE

ACROSS

1. Sudden current or voltage changes in a circuit.
4. Used in the grid circuit of a vacuum tube to provide a necessary voltage.
10. The unit of luminance.
11. Unit of magnetic intensity or magnetizing force equal to one gilbert in one centimeter.
12. The pitch, duration, or both of a tone sensation.
13. A glow lamp that produces intense flashes of light when fed with timed voltage pulses.
16. Above.
17. A device used in some mechanical television systems to modulate a light beam with television signals.
18. Standard screw-thread base used for electric lamps.
22. Also called a needle.
24. A unit of loudness.
25. Short for address system.
28. The ease with which an alternating current flows in a circuit.
30. Breathing device.
32. Potential difference or voltage.
34. A cathode-ray tube developed in England.
35. The superposition of one image onto another (e.g., in the formation of an interlaced scanning raster).
36. The positive nucleus of the hydrogen atom.

DOWN

1. A chemical element used as a rectifier layer in metallic rectifiers.
2. Any system of control performed from a distance.
3. Level.
5. Variations of a chemical element, each having the same atomic number but differing in atomic weight.
6. A device that contains and delivers power to move a control.
7. Eastern Standard Time. Abbr.
8. A loading.
9. The Stationary plates of a variable capacitor.
14. A number which, when multiplied by itself a number of times, equals a given number.
15. Elementary unit of storage.
19. Electrically charged atom or group of atoms.
20. To stop a flow.
21. An alloy wire used in precision wire-wound resistors because of its low temperature coefficient of resistance.
23. The part of a transmitter that translates the densities of the elemental areas of the subject copy into signal-waveform.
24. An opening that supports and electrically connects to vacuum tubes or components when they are inserted into it.
26. The spring fastened around the drum to hold the record sheet or copy in place.
27. A rotatable device on which one or more pretuned circuits are mounted for use in all-wave receivers.
29. Identical pair.
31. An array of antenna elements, one above the other.
33. Negative. Abbr.



SOLUTION ON PAGE 141

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

PERSONAL ATTENTION plus the best cash deal anywhere is what you receive at QUEEN CITY ELECTRONICS in the heart of the Midwest. Queen City carries all major brands including Drake, Tempo, Kenwood, Yaesu, Swan, Regency, Clegg, Standard, ICOM, Genave.... write or phone us for your equipment needs. Queen City Electronics, Inc., 7404 Hamilton Avenue, Cincinnati, OH 45231 (513) 931-1577.

TECH MANUALS for govt. surplus gear – $6.50 each: R-390/URR, R-220/URR, URM-25D, CV-591A/URR, CV-278/GR, TRM-1, TS-382D/U, TS-497B/URR, TT-63A/FGC, URM-32. W3IHD, 7218 Roanne Drive, Washington DC 20021.

LEARN DESIGN TECHNIQUES Electronics Monthly Newsletter. Digital, linear construction projects, design theory and procedures. Sample copy $1.00. Valley West, Box 2119-E, Sunnyvale CA 94087.

BUY-SELL-TRADE Write for monthly mailer. Give name address call letters. Complete stock of major brands new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc. SSB and FM. Associated Radio, 8012 Conser, Overland Park KS 66204. 913-381-5901.

VERY INTERESTING! Next 5 issues $1. "The Ham Trader," Sycamore Il 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, transmitters, transceivers, amplifiers 1945–74. Indispensable!)

ELECTRONIC SURPLUS – resistors 1/4 and 1/2 watt 5¢, capacitors 10¢, tube and solid state components. Catalog 10¢. SASCO Electronics, 1009 King St., Alexandria VA 22314.

FREE: 12 extra crystals of your choice with the purchase of a new Regency HR-2B at $229. Send cashier's check or money order for same-day shipment. For equally good deals on Collins, Drake, Kenwood, Standard, Clegg, Swan, ICOM, Genave, Hallicrafters, Tempo, Midland, Ten-Tec, Venus Hy-Gain, CushCraft, Mosley, and Hustler, write to Hoosier Electronics your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. (812) 894-2397.

YOUR SWAP-N-SELL ads run free in TRADIO, a public service publication of Wichita Amateur Radio Society Box 4391 Wichita Falls TX 76308.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding, literature Estes Engineering, 543-A West 184 Street, Gardena CA 90248.

FOUNDATION for Amateur Radio annual hamfest Sunday, October 20, 1974 at Gaithersburg Maryland Fairgrounds.

MOTOROLA PORTABLES Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal services, 6663 Industrial Loop, Greendale WI 53129.

CALL LETTER LICENSE PLATES – still being collected by 73 Magazine for possible cover use. Please send in an old call letter plate – most treasured are out-of-district plates such as W2NSD/NH, etc. Got any real oldies? 73 Magazine, Peterborough NH 03458.

JIG SAW PUZZLES wanted. If you have any old wooden jig saw puzzles in your attic – or run across them at an auction (they go for 25¢ usually), please keep in mind that Wayne Green collects them and might even pay a buck a peice for them. c/o 73 Magazine, Peterborough NH 03458. Wood, not cardboard – and complete.

WANTED: General Class (or higher) hams to join 4,500 member Morse Telegraph Club. Hundreds of hams already belong. Send modest $3 annual dues (includes subscription to great slick paper newspaper "Dots and Dashes") to GST A. J. Long, 520 West Schwartz Street, Salem IL 62881 for membership card and assignment to nearest chapter.

TRADE: Collins 390A and manual for late model transceiver – write what you have George Keys WA6KAA, 1334 N. Broadway, Santa Maria CA 93454. 805 925-7755.

CU-286/FRR-33 – New Collins 1-32 MHz antenna/receiver tuner coupler with autotune circuit for remote operation. With schematic and power connector, $50. WA1TEJ, 100 Granite St., Londonderry NH 03053.

REGENCY TMR-16H/L/UHF executive scanner, like new, never used since unpacked. Covers 2, 6 and 3/4 meter FM activity. $125 sacrifice. WA1TEJ, 100 Granite St., Londonderry NH 03053.

AN/ARC-27 – Two complete (fixed or mobile) 220 MHz systems: Two RT-178/ARC-27 Collins Synthesized transceivers (200-399.9 MHz), various control boxes, cables, connectors, shock mount, blade antenna, spares and manual. Units can be interconnected to operate repeat or used as mobiles, control stations or U.S. military monitor sets. $200. WA1TEJ, 100 Granite St., Londonderry NH 03053.

WANTED: CV-89A/URA-8A in good condition with cabinet (must be working) or AN/URA-17 Comparator Converter Group; brackets for mounting CV-89 in 19" rack. Write WA1TEJ, 100 Granite St., Londonderry NH 03053.

FOR SALE: Heath HW101 transceiver aligned at factory, HP23B AC Power Supply, SB600 Communications Speaker, HM102 RF Power meter. all in excellent condition, one year old. Also Turner 454C SSB Ceramic Microphone, excellent condition. Best offer takes all. Ben Johnson, RR1 Box 117 Apt. 2, O'Fallon IL 62269.

NOW PAYING $2000.00 and up for ARC-94/618T ARC-102/618T. $1200.00 and up for ARC-51BX. $1500 and up for 490T-1 antenna couplers. We also need these control boxes – C-6287/ARC-51BX C-6476/ARC-51BX C-714E-2. We also need R-1051 receivers RT-662/Grc-106 transceivers. We buy all late aircraft and ground radio equipment. Also pack radios. We are buyers not talkers. Bring your equipment in, you are paid on the spot. Ship it in, you are paid within 24 hours. We pay all shipping charges. If you want the best price for your equipment, call us. Call collect if you have and want to sell or trade. We also sell. What do you need? D&R Electronics, R.D.1 Box 56, Milton PA 17847. Phone 717 742-4604. 9:00AM – 9:00PM.

AN/FRR-23 (AN/SRR-13) general coverage modular receiver with book, excellent condition. $100. WA1TEJ, 100 Granite Street, Londonderry NH 03053.

RCA SENIOR VOLTOHMYST – professional grade VTVM, new, never used. $50. WA1TEJ, 100 Granite St., Londonderry NH 03053.

EQUIPMENT CLOSEOUT

The following equipment has been purchased by 73 Magazine for test or has been received in lieu of payment for ads. Most gear is either brand new in the original cartons or else like new after a few days of testing in the 73 labs.

MITS 908M Calculator w/p.s./case ($143) new	$ 79
Vanguard Scaler ÷ by 10 – to 200MHz ($120)	$ 75
Pickering CW keyboard KB-1 ($265) tested	$ 155
Motorola KW 2m amplifier–used	$ 375
Heath IC-2009 calculator–brand new ($92)	$ 79
Signal One CX7-A–tested–perfect–like new–fantastic	$1989
Concord video monitor VM-12–tested ($400)	$ 199
Concord all channel TV tuner Dem-911 ($800)	$ 199
Regency 450 MHz scanner–($200)–like new	$ 139
Varitronics PA-50 2m amp ($110) brand new–10w in 50 Wout	$ 89
RP tone burst gen–5 freq TB-5–exc ($37.50)	$ 25
Regency HR-6 ($240) six meter 10w xcvr 12ch	$ 189
Regency ACT-R8H/L Scr ($160) VHF/UHF 8ch scr receiver	$ 129
Standard SR-C826MA ($398) Latest model 10w 12ch 2m xcvr	$ 329
Regency HR-2MS ($319) 2m 15w xcvr with 8ch scanner	$ 259
SBE SB-450TRC ($180) 450 MHz transverter	$ 139
Regency Pocket scanner 4 channel ACT-P4H ($120)	$ 89
Cobra 220 MHz Transceiver 10w 12ch ($300)	$ 255
Standard 14 U 2m 22ch superfantastic rig, VOX ($510) demo	$ 429
Pacificom 2m HT–brand new–($250)	$ 189

All Prices fob: UPS collect.
73 Magazine – Peterborough NH 03458

ROCHESTER NY – Hamfest date for 1975 – May 31st. Marriott Inn is new headquarters. Information? Write WNY Hamfest, Box 1388, Rochester NY 14603.

DESIGN ENGINEERS. Our expanding Atlanta based electronics company has several opportunities for BSEEs or MSEEs Design Engineers to join our group dedicated to the design and development of satellite communications equipment. We are seeking candidates for these positions who are hardware oriented engineers with background in some of the following areas: Solid State Microwave low-noise and power amplifiers; Frequency converters; Analog & Digital modems; IF Circuitry; Base band processing circuitry; Frequency sources; MIC Techniques. To explore these excellent career opportunities, please call collect to: Bob Placek or Jim Wallace 404-938-2930. Or send resume in confidence to: Personnel Manager, Scientific-Atlanta, Inc., P.O. Box 13654, Atlanta, GA 30324. An equal opportunity employer.

REWARD! Ten dollars reward for return of 73 Magazine flag lost at Dayton.

REGULATED POWER SUPPLIES 13.8 volt 3% regulation. 3.5 amp – 34.95 7 amp 59.95. Also 1, 14, 25 amp. Meters available. Enterprise Electronics, Box 61, Monroe OH 45050.

WANTED: Cash for a good automatic voltage regulator, also need a transceiver, band scanner, antenna rotator, transmatch. Albert, 304 East Courtland, San Antonio TX 78212.

PERSONAL ATTENTION plus the best cash deal anywhere is what you receive at QUEEN CITY ELECTRONICS in the heart of the Midwest. Queen City carries all major brands including Drake, Tempo, Kenwood, Yaesu, Swan, Regency, Clegg, Standard, ICOM, Genave... write or phone us for your equipment needs. Queen City Electronics, Inc., 7404 Hamilton Avenue, Cincinnati OH 45231 (513) 931-1577.

DRAKE: 2B, 2BQ, 2AC. All 10 meter crystals, plus 5 extra crystals (WWV etc.) manual. Excellent condition package $175.00. Call Jim W1VYB 617 922-3850.

AUTOPATCH – Using your Touch-Tone pad, key your transmitter without holding P.T.T. switch. 1½ to 2 sec delay. G-10 glass P.C. board, schematic, pictorial, and parts list. $2.50 plus C.O.D. WB6FXF Rick 1613 E. Portola Avenue, Santa Ana CA 92701 or call 714 836-9363.

TT-513/FR – Solid-State RTTY non-impact teleprinter, accepts all speeds, excellent condition with manual and connector. $150. WA1TEJ, 100 Granite Street, Londonderry NH 03053.

CANADIANS – We stock a broad line of electronic parts, including solid-state. Send for free flyer, DARTEK ELECTRONICS, Dept. 7, Box 2460, Dartmouth, Nova Scotia.

FM-27B and homebrew power supply $325. Clean, used as base station. WA2VWM Dave 1420 York Avenue, New York NY 10021. 212 734-4135 (After 1800).

BUILD a 200MHz frequency counter. 8 digit LED readout. Drilled boards with instructions for 20MHz counter $25. 200MHz prescaler option $3.50. Manual only $5.00. DAVIS ELECTRONICS, 6 W. Oakwood Buffalo NY 14214.

SOLID STATE components, readouts and LEDs. Free flyer. DAVIS ELECTRONICS, 6 W. Oakwood, Buffalo NY 14214.

FM WIRELESS mike transmitter kit $2.00. DAVIS ELECTRONICS, 6 W. Oakwood, Buffalo NY 14214.

250MHz prescaler board. Drilled, with instructions $3.50. DAVIS ELECTRONICS, 6 W. Oakwood, Buffalo NY 14214.

WANTED: Drake AA-22 2MHz FM transmitter receiver amplifier; perfect operating condition only. Howard Pence, 524 S. Washington, Montpelier IN 47359. Phone 317 728-2588.

VOLUNTEER needed in Orange, California area to handle traffic for Bible translators. Also need RTTY gear; tax deductable. WA8BHR, 4466 Burtch, North Street, MI 48049.

FOR SALE: Thriving 2-way Buisness in medium size Midwest market. $40,000.00 annual Gross. For further information write c/o Box J, 73.

TV-3B/U NAVY portable tube tester, good working condition. $25. WA1TEJ, 100 Granite St., Londonderry NH 03053.

TUBE WARRANTY CLAIMS

Although the price of receiving-type tubes is quite low, and a 12AX7 won't break very many of us, the enlightened amateur will check the warranty information on his tubes carefully.

Most tubes are guaranteed for two years from date of manufacture, with a six-month shelf life allowance. If the tube gives unsatisfactory service, except for burned-out filaments or breaks, the manufacturer will generally replace the tube.

At WA6CPP I have had occasion to return two tubes to my friendly parts house in the past month. Covered by the warranty, these were promptly and cheerfully replaced. The $6 saving, while not much, can be budgeted for other essential items often needed.

It is a good idea to check the tubes on receipt, running them for a week or so to see if they are working properly. Also, be sure to hang on to the invoice the counterman gives you, in case there arises a question whether you got the tubes there or from the supermarket machine.

...WA6CPP

MEMPHIS TENN, OCT 6

The Mid-South Amateur Radio Association is sponsoring the Memphis Hamfest on Sunday October 6 at State Technical Institute, 1-40 at Macon Rd (Exit 11). Seminars, demos, displays, XYL program, prizes, flea market, fun. Talk in 3980, 34/94, and Army Mars. Trailers and campers hookup at Welcome Inn across street. Holiday Inn there too.

SAN DIEGO NOV 1–3

ARRL SW Division convention — Town and Country Hotle — talk in 34-94, 3900, 7250. $5.50 registration, $9.75 banquet. Write Box 82297, San Diego CA 92138 for info and pre-registration details.

BERMUDA Oct 13-20

This is amateur radio week in Bermuda. Oct. 16th: annual meeting of the Radio Society of Bermuda. Oct 18th: annual RSGB dinner at Holiday Inn, St.Georges honoring the winners of the Bermuda contest. Oct. 19-20 portable operation of VP9Bs in the Scout Jamboree. To get a license to operate in Bermuda write to the Radio Society of Bermuda, Box 275, Hamilton Bermuda. Travel and lodging should be arranged with your local travel agent.

EL PASO TX OCT 12-13

Hamfest and swapmeet — seminars, prizes, flea market. Info: WB5CMB, 7772 Gran Quivira, El Paso TX 79904.

WINNIPEG MAN. OCT 5-6

Hamfest "74," International Inn, Winnipeg. Reg to VE4RL, Box 352, Winnipeg Man. Can. R3C 2H6 $1 ea. Dinner and dance Sat. $4 each. Hotel $24 couple special. Xmtr hunt, mobile contest, homebrew contest, XYL events, big prizes, auction.

GAITHERSBURG MD OCT 20

Foundation for Amateur Radio annual hamfest at the Gaithersburg Fairgrounds. Flea market, exhibits, events, many prizes, picnic grounds and free parking. For infor write or call Bill Miller K4MM, 10919 Woodfair Road, Fairfax Station, VA 22039, 703 273-0112.

WEST GHENT NY OCT. 5

Northeast States 160 Meter Association annual fall meeting at Kozel's Restaurant, West Ghent (near Hudson). Flea market, dinner, prizes, starts 2 pm. Dinner $5.75 ea. — reservations: W1JEC, Box 44, West Granby CT 06090.

QCWA NATIONAL CONVENTION
Disney World

October 25-26 — make plans now to attend this QCWA National. Write W4UKA, 635 SE 19, Ocala FL 32670.

SO. SIOUX CITY NB, OCT 4-5-6

The ARRL Midwest Convention will be held at the Marina Inn, South Sioux City NB sponsored by the 3900 Club. Theme — tribute to handicapped amateurs. Friday noon start. QCWA dinner, portable repeater, SSTV, ATV, Amsat demo, QRP session, ARRL forum, repeater forum, traffic forum, flea market, Mars, exhibits. $7 reg to WØEQN 3818 5th Avenue, Sious City IA 51105. Banquet $6.

CIRCUITS, CIRCUITS, CIRCUITS

A SIMPLE PULSE GENERATOR USING THE SIGNETICS 555 TIMER

Christer Falkenstrom SM4DZR
Box 120
S-660 80 Fagerds
Sweden

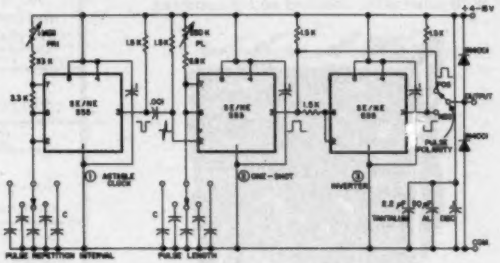
This pulse generator is a very useful tool. It is mainly intended to be used as a variable clock when breadboarding or testing digital IC systems, especially at low clocking rates. Due to the wide range supply voltage allowed for the SE/NE555 it can be used with RTL, DTL, TTL, and HiNil. It uses the existing system voltage, anything between +4 and +15V. This circuit comprises three 555 Timers.

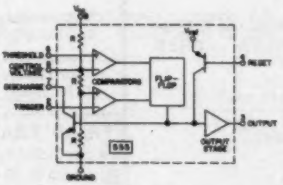
The first 555 is connected as an astable clock. The leading edge of the negative output pulse is used to trigger the second 555. This is connected as a one-shot and delivers a positive-going pulse which is used as the positive output. The third 555 is connected as an inverter to generate the negative-going output pulse. This pulse appears about 4μ after the positive pulse has started. The rise and fall times are about 100nS. Output currents are 100mA and more. With a load of 1 KΩ between output and $+V_{CC}$ the current drawn by the complete circuit is 17mA at 5V, and 52mA at 15V. In the prototype ten heavily overlapping ranges were chosen, mainly depending on the availability of 10-way selectors. The following table shows the capacitor values and the corresponding PRI and PL ranges achieved. These values are by no means circuit limitations, the timing can be extended to minutes with suitable capacitors.

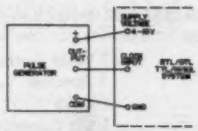
C:	PRI		PL	
.0022 μF-	70 μS –	1 6 mS	15 μS –	580 μS
.0047 μF	130 μS –	3,7 mS	34 μS –	1,3 mS
.01 μF	280 μS –	8,1 mS	71 μS –	2,8 mS
.022 μF	600 μS –	17 mS	165 μS –	6,6 mS
.047 μF	1,4 mS –	40 mS	350 μS –	14 mS
.1 μF	2,8 mS –	78 mS	770 μS –	30 mS
.22 μF	6,1 mS –	172 mS	1,7 mS –	67 mS
.47 μF	12 mS –	360 mS	3,1 mS –	122 mS
1 μF	30 mS –	810 mS	8 mS –	330 mS
2,2 μF	62 mS –	1,76 S	17 mS –	700 mS

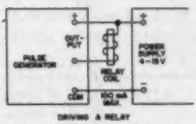
The following circuits have appeared in the reference books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.



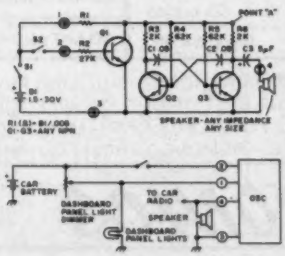




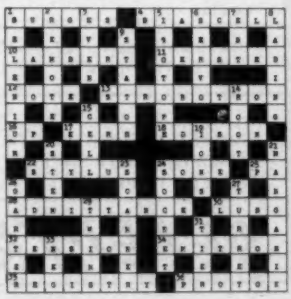


USEFUL OSCILLATOR

S1 turns on osc. S2 turns it off. Uses are many – such as an auto headlight reminder, sidetone oscillator, code osc., square wave generator, etc. For auto headlight reminder connect 1 to the dashboard panel lights, 2 to the car battery via S2, 3 to ground and 4 to the car radio speaker. Voila! Thanks W7BBX.



ANSWER TO PUZZLE



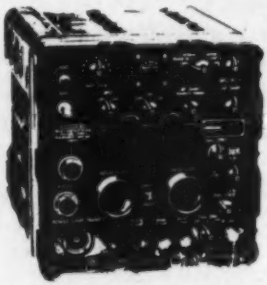
ANOTHER SELECTRONIC SPECIAL
For This Issue Only
RADIO RECEIVER R–392/URR

Freq. Range: 500 KC to 32 MC in 32 bands. Types of Signals Received: CW, MCW, Voice (AM) and Freq. Shift Radio Teletypewriter. Type of Tuning: Continuous: Freq. Read Directly on Counter–Type Freq. Indicator. Method of Calibration: Built-in crystal Calibrator. Calibration Points: Every 100 KC. Nominal Input Voltage: 28 Volts DC; will operate on an input of 25 to 30 V.

PRICE: $195.00 **F.O.B. Philadelphia, PA**

Shipping Wt. 50 lbs. *(with schematic)*

With schematic, checked and guaranteed.



We will include with every purchase the following accessories for the above receiver – **FREE**

1 Whip Antenna
1 Speaker
1 Mike
1 Set Connecting Cables
1 Head Set
1 Telegraph Key

We have a few of the R-392/URR Receivers that need minor repairs, good shape as is, physically complete. **$125.00**

ADJUSTABLE PRINTED CARD BOX
For Rack Mount
5" to 7¼" – 16 slides and sockets – includes 30 double contact position edge connector type
PRICE $9.95

MODERN ALUMINUM BENCH RACK CABINET
11¾" H x 18" D x 19" W. 8" panel openings w/rubber feet and disappearing handle.
Lt Blue **Price: $7.95 ea.**

Triad transformers F-21A 115 Volts 60 cycles 6.3 VCT at 10 Amps. **Price: $4.95.**

R-508 VHF RECEIVER
118-148 MHz, part of ARC-60 aircraft radio set. Front panel tuning 118-148 MHz, lightweight, compact, 5" x 6" x 12". 28 VDC input, 250V, 50mA, dynamotor. **Price: $14.95**

DIGITAL READOUTS SETS
Make your own counter, frequency meter, digital voltmeter, readouts, etc. Includes 6-B 5031 mixes w/sockets (.6" character height), 1 transformer, 1 p/s board with socket.
Price: $12.95, 2/$20.00
Small B-5031 nixies no board w/socket **4/$5.00**

ANOTHER SPECIAL
LARGE ALPHA NUMERIC READOUTS
Two B7971 tubes in sockets, driver transistors and components all on one board – can be used for clocks, counters, numerous other uses. . . .
Price: $2.00 a board, 3/$5.00

Oil Capacitor
177 UFD – 1000 Volts $10.00 2/$18.00

VU Volume Level .20 to + 3 **$4.95**

SOCKETS
Sockets for 4 x 150's – 2 sockets with chimney, mounted on aluminum chassis **$7.00**

MODULE TYPE P/S
AC input 95-125 VAC-60Hz-100 watts.
+12VDC@ .375A -12VDC@ 3 AMP.
6VDC@ .375A
Regulation 1%. Front panel adj. ±10%. 5 1/8" x 7 3/8" x 7"
Price: $14.95, 2/$25.00

Lighted switches 2 pdt push pole panel mount 5/8" hold. **Price: $1.00 each, 6/$5.00**

TRIAD TRANSFORMER – F-22 115 volts, 60 cycles 6.3V ct at 20 amps. **$5.95**
4 x 150 D 28 volt filament **$5.95, 2/$10.00**

TOROID INVERTER
P/S high efficiency, equipped with cooling and for continuous duty. Input 27.5V at 5.5 amps, output 250 VDC at 300 mA, 45 VDC at 10 mA, 115 VAC 400 cycle at 30 VA. 3" round by 8 3/4" long. 6 lbs.
$9.95

ANOTHER TOROID INVERTER
Input 27.5 V at 23 amps. Output 1000V at 500 mA. 4" round x 8½" long. 8 lbs. Both inverters operate on 12 VDC one half voltage output. **$14.95**

METERS – 1 3/4 square, 1½ hole mount - 1" behind panel. 0–25 mA FS. **$2.50**

ADAPTERS BNC to SO–239 **2/$1.00**

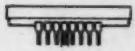
ALL PRICES ARE F.O.B. OUR WAREHOUSE, PHILADELPHIA, PA. ALL MERCHANDISE DESCRIBED ACCURATELY TO THE BEST OF OUR KNOWLEDGE. YOUR PURCHASE MONEY REFUNDED IF NOT SATISFIED. TERMS ARE CASH. MIN. ORDER $5.00. ALL MERCHANDISE SUBJECT TO PRIOR SALE. RFE – REMOVED FROM EQUIPMENT.

SELECTRONICS

1206 South Napa Street
Philadelphia, PA 19146
215-468-7891 215-468-4645

The Hybrid Analog TONE GENERATOR

MH8913J $18.00



DATA and APPLICATION SHEETS FURNISHED WITH ORDER

general specifications

Frequency Drift[1]: < 1.5%

Group Amplitude Stability: ±25%

Total Distortion (Harmonic + Intermodulation): < 5% (relative to level of fundamental frequencies)

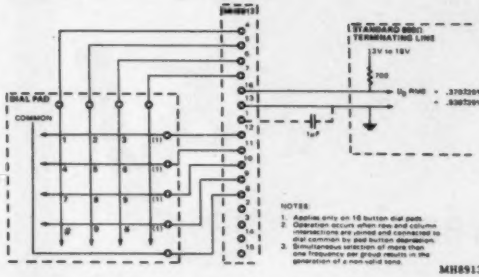
Typical Rise Time to Specified Output and Frequency:

1) Frequency selected, power supply switched < 5ms
2) Power applied, frequency selector switched < 2ms
3) Power applied, frequency within same group changed < 2μs

features

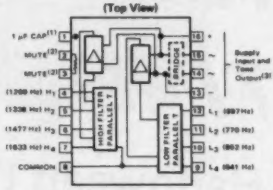
- Dual Frequency Capability
- Standard Telephone Tone-Dial Frequencies: Low Group – 697, 770, 852, 941 Hz; High Group – 1209, 1336, 1477, 1633 Hz
- Specification Ratings Exceed CCITT Recommendations

typical circuit connection diagram



NOTES:
1. Applies only on 16 button dial pads.
2. Operation occurs when row and column intersections are joined and connected to dial common by pad button depression.
3. Simultaneous selection of more than one frequency per group results in the generation of a non-valid tone.

block diagram and pin configuration



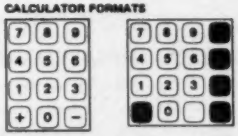
MH8913J CAN BE USED WITH CHOMERICS #ER21624 TOUCH TONE KEYBOARD

CHOMERICS®

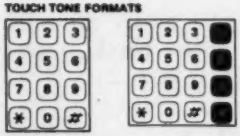
QUICKEY® TACTILE KEYBOARDS

FORMATS
Standard legends are black and white set in Standard Medium type.

CALCULATOR FORMATS

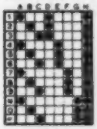


TOUCH TONE FORMATS

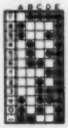


CODING

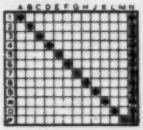
Touch Tone 12 Key



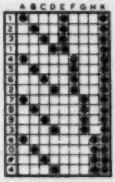
BCD 12 Key



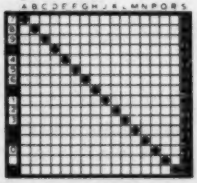
Single Pole 12 Key



Touch Tone 16 Key



Single Pole 16 Key



1/2" centers Model #	Price	3/4" centers Model #	Price	Format	Coding	# of Keys
ER 21622	7.15	ER 21605	7.70	Touch tone	Single pole	12
ER 21623	8.70	ER 21606	9.25	Touch tone	Touch tone	12
ER 21624	9.25	-	-	Touch tone	Direct to MH8913	12
-	-	ER 21607	7.70	Calculator	Single pole	12
-	-	ER 21608	11.00	Calculator	BCD	12
ER 21625	8.70	ER 21609	9.25	Calculator	Single pole	16
-	-	ER 21610	9.25	Touch tone	Single pole	16
-	-	ER 21611	11.15	Touch tone	Touch tone	16

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A&W

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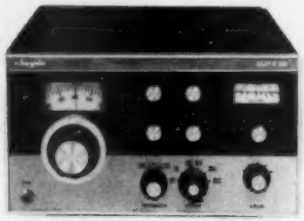
The 18AVT/WB is constructed of extra heavy duty, taper swaged, seamless aircraft aluminum with full circumference, corrosion resistant compression clamps at all tubing joints. This antenna is so rigid, so rugged . . . that its full 25' height may be mounted using only a 12" double grip mast bracket . . . no guy wires, no extra support . . . the 18AVT/WB just stands up and dishes it out!

18AVT/WB

hy-gain

GALAXY GT 550A



- Crystals supplied for 3.5 to 4.0, 7.0 to 7.5, 14.0 to 14.5, 21.0 to 21.5, 28.0 to 29.0 MHz. Optional xtals may be installed for other 10 meter coverage.
- Plate Power Input: 550 watts PEP on SSB - 360 watts on CW and RTTY (50% duty cycle).
- Power Output: 300 watts PEP (nominal) on SSB - 180 watts on CW and RTTY.
- Receiver Selectivity: 2.1 kHz with 1.8 shape factor for SSB or 300 Hz sharp selectivity with optional CW filter.
- Freq. Stability: Within 10 Hz during any 30 minute warm-up period, less than 100 Hz in any 15 minute warm-up period, not more than 100 Hz with a plus or minus 10% line voltage variation.

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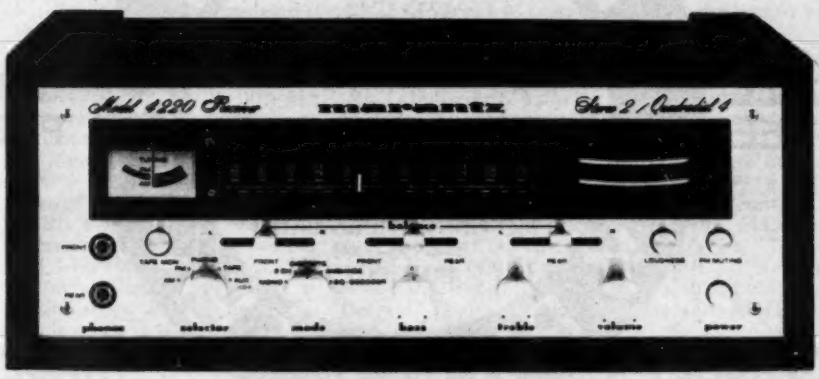

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STEREO 2 + QUADRADIAL 4

Affordable 4-channel by Marantz. The 4220 is the most economical of all Marantz Quadradial receivers. But it doesn't compromise quality or craftsmanship. For example, the 4220 features SQ, with logic for decoding SQ records and tapes. And you don't have to worry about replacing your stereo collection. An ambience circuit is included which gives many stereo recordings the full 4-channel effect of a live performance. There's still plenty of power to fill a room with that dynamic Marantz sound. Over 20 Watts per channel for stereo and more than 8 Watts per channel for Quadradial. Gyro-Touch tuning, 4-channel balance controls and loudness compensation switch are all standard.

MARANTZ 2015
2245
2220
4220

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THE SOLID STATE SURPLUS OCTOBER AD

Dear Customer,

This month we're going to answer a question that many people ask: what exactly is a "surplus" IC?

An IC may be considered surplus for a variety of reasons, none of which need to reflect on the quality of the part.

One large source of surplus parts is companies that go out of business, and need to sell off inventory to minimize their losses. Another source is semi-conductor manufacturers with just too much stock, due perhaps to overproduction or overestimation of demand. In this case, the manufacturer is better off selling the stock at a lower but still profitable price to the surplus dealer.

Some parts are also considered "defective." No doubt this raises fears in the mind of the buyer, but consider what an IC manufacturer calls defective. An IC classified as "cosmetically defective" means that it is a perfect functioning unit, but with a flaw in the looks that makes resale at full price difficult (for example, scratches or marks in the case from handling). Another source for "reject" ICs is high-reliability programs, where extremely critical parameters must be met. A company may manufacture a load of parts, but only sell the ones with the absolute tightest specs. What happens to the rest? They're considered prime units for resale; unless you're building a moon rocket, they are.

At Solid State Surplus, we try to be as careful as possible when deciding which lots of parts to buy. But being careful isn't really enough, so we test every single one (no, not spot checks, *each one*) and make sure that it meets consumer and industrial grade parameters. If it does, it stays. If it doesn't, it usually goes back to the factory and gets any precious metals reclaimed.

So much for the discussion. Now for the nitty-gritty sales pitch.

We've got linears. . .741, 747, 558 op amps. . .the 3900 current-differencing, single-supply quad op amp. . .a choice of regulators: the 309 (5 or more volts out, blow-out proof, current-limiting, 1 amp @ 5 volts) and the 723 (less power, more precision). . .a choice of comparators, too, either the 339 quad single-supply comparator, or the industry favorite 311; fast, and it can handle a fairly heavy load (relay etc.). . .the 555 timer, as versatile a building block as the op amp. . .and two unusual op amps, the 4250 micropower type, and the 531 fast slew op amp.

But that's not all. We are happy to announce the addition of the CD4016, an IC containing 4 independent electronic switches using CMOS technology. A control voltage determines whether the switch is open or closed. In some cases, you can even use them linearly, like a voltage-controlled attenuator. Anyway, they're good to have around; get a few and find out.

If you've talked to anyone who's ordered from us lately, you'll find we still (1) ship airmail whenever possible, even with the rate increases (2) give fast turnaround, 24-48 hrs. ARO (3) don't backorder — we give you back your check if we ain't got it.

LM309 5V 1A	$1.20
LM723D regulator	.65
LM311 comparator	1.00
LM339 quad comp.	1.50
LM555 timer	.85
CD4016 quad switch	1.25
LM741 minidip op amp	.35
LM747 dip dual 741	.70
LM1558 mini dip dual	.75
LM3900 quad op amp	.45
LM4250 micropower amp	2.00
NE531 hi slew amp	1.25

We'll have something new for you next month. . .

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- Ground reference for positive & negative output from single supply — any DC source to 20V
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- 1 amp-current capability with sink
- increase usefulness of your power supply

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- MM 5736 18 PIN Calc. Chip four function 6 Digit
- A pair of 3-in-1 PAKS (6 digit) LED NSN 33
- One 75492 HEX Digit driver

Schematic and instructions included. You supply switches, keyboard and battery for complete calculator. $9.95

DIGITAL INTEGRATED CIRCUITS

	Ea.		Ea.		Ea.
7400	$ .19	7447	$1.15	74141	$1.25
7401	.19	7448	1.15	74145	1.15
7402	.19	7450	.24	74150	1.09
7403	.19	7451	.27	74151	.89
7404	.22	7453	.27	74153	1.29
7405	.22	7454	.39	74154	1.59
7406	.39	7460	.19	74155	1.19
7407	.39	7464	.39	74156	1.29
7408	.25	7465	.39	74157	1.29
7409	.25	7472	.36	74161	1.39
7410	.19	7473	.43	74163	1.59
7411	.29	7474	.43	74164	1.89
7413	.79	7475	.75	74165	1.89
7415	.39	7476	.47	74166	1.65
7416	.39	7483	1.11	74173	1.65
7417	.39	7485	1.39	74176	1.09
7420	.19	7486	.44	74177	.99
7422	.29	7489	3.75	74180	1.09
7423	.35	7490	.76	74181	3.65
7425	.39	7491	1.29	74182	.89
7426	.29	7492	.79	74184	2.69
7427	.35	7493	.79	74185	2.19
7430	.22	7494	.89	74190	1.59
7432	.29	7495	.89	74191	1.59
7437	.45	7496	.89	74192	1.49
7438	.39	74100	1.65	74193	1.39
7440	.19	74105	.49	74194	1.39
7441	1.09	74107	.49	74195	.99
7442	.99	74121	.57	74196	1.09
7443	.99	74122	.53	74197	.99
7444	1.10	74123	.99	74198	2.19
7445	.99	74125	.69	74199	2.19
7446	.99	74126	.79	74200	7.95

LOW POWER TTL

74L00	.33	74L51	.33	74L90	1.69
74L02	.33	74L55	.33	74L91	1.45
74L03	.33	74L71	.33	74L93	1.69
74L04	.33	74L72	.49	74L95	1.69
74L06	.33	74L73	.69	74L98	2.79
74L10	.33	74L74	.69	74L164	2.79
74L20	.33	74L78	.79	74L165	2.79
74L30	.33	74L85	1.25		
74L42	1.69	74L86	.69		

HIGH SPEED TTL

74H00	.33	74H21	.33	74H55	.39
74H01	.33	74H22	.33	74H60	.39
74H04	.33	74H30	.33	74H61	.39
74H08	.33	74H40	.33	74H62	.39
74H10	.33	74H50	.33	74H72	.49
74H11	.33	74H52	.33	74H74	.53
74H20	.33	74H53	.39	74H76	.59

8000 SERIES TTL

8091	.59	8214	1.69	8811	.69
8092	.59	8220	1.69	8812	1.10
8095	1.39	8230	2.59	8822	2.59
8121	.89	8520	1.29	8830	2.59
8123	1.59	8551	1.65	8831	2.79
8130	2.19	8552	2.49	8836	.49
8200	2.59	8554	2.49	8880	1.33
8210	3.49	8810	.79		

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9002	.39	9309	.89	9601	.99
9301	1.14	9312	.89	9602	.89

Please specify data sheets required with order. Add $.50 per data sheet for items priced less than $1.00 each.

I²L

74C00	.39	74C74	1.15	74C162	3.25
74C02	.55	74C76	1.70	74C163	3.25
74C04	.75	74C107	1.50	74C164	3.50
74C08	.75	74C151	2.90	74C173	2.90
74C10	.65	74C154	3.50	74C195	3.00
74C20	.65	74C157	2.10	80C95	1.50
74C42	2.15	74C160	3.25	80C97	1.50
74C73	1.55	74C161	3.25		

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CD4001	.55	CD4013	1.20	CD4023	.55
CD4009	.85	CD4016	1.25	CD4025	.55
CD4010	.85	CD4017	2.95	CD4027	1.35
CD4011	.55	CD4019	1.35	CD4030	.95
CD4012	.55	CD4022	2.75	CD4035	2.85

MEMORIES

1101	256 bit RAM MOS	1.75
1103	1024 bit RAM MOS	4.95
5260	1024 bit RAM Low Power	3.95
7489	64 bit RAM TTL	2.75
8223	Programmable ROM	4.95

CALCULATOR CHIPS

5001	LSI (40-Pin) Add, subtr., mult. & div., 12-dig. Data supplied with chip	$3.95 ea.
	Data only — Refundable with purchase	1.00
5002	LSI similar to 5001 exc. des. for battery operated - Data supplied with chip	7.95 ea.
	Data only — Refundable with purchase	1.00
5005	LSI (28 pin) Full 4 funct. mem. 12-dig. displ. & calc. 7 reg. mltplr. outp. Data suppl. w/chip	5.45 ea.
	Data only — Refundable with purchase	1.00
MM5736	18 Pin, 6-dig., add, subtr., mult., div.	3.95 ea.

DIGITAL CLOCK CHIPS

MM 5311	28-pin any readout 6-dig. BCD mux with spec. sheet	9.95 ea.
MM 5312	24-pin any readout 4 digit bpa output BCD mux with spec. sheet	6.95 ea.
MM 5313	28-pin any readout 6 digit bpa BCD mux with spec. sheet	7.95 ea.
MM 5314	24-pin LED-incandescent readout mux 6-digit with spec. sheet	8.95 ea.
MM 5316	40-pin norm. alarm set snooze alarm-timer 12 or 24-hr. operat. with spec. sheet	12.95 ea.

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MV10B	Visible red TO 18	.25 ea.
MV50	Axial leads micromini dome .25 ea.	5/1.00
MV5020	Jumbo clear dome visible red .31 ea.	3/1.00
ME4	Infra red (invisible) diff. dome	.60 ea.

DISPLAYS

MAN1	Red, 7 seg., .270"	$2.50 ea.
MAN2	Red alpha numeric, .32"	4.95 ea.
MAN3A	Red, 7 seg., .127" in line leads	.79 ea.
MAN3M	Red, 7 seg., .127" staggered leads	1.15 ea.
MAN4	Red, 7 seg., .190"	2.15 ea.
MAN5	Green, 7 seg., .270"	2.95 ea.
MAN7	Red, 7 seg., .270"	1.39 ea.
MAN8	Yellow, 7 seg., .270"	3.95 ea.
MAN66	.75" high direct viewing LED	4.65 ea.
DL707	Red, 7 seg., .3"	2.15 ea.

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MCD2	Diodes	$1.09 ea.
MCT2	Transistor	.69 ea.

PHASE LOCKED LOOPS

560	Phase Locked Loop	DIP	2.75 ea.
561	Phase Locked Loop	DIP	2.75 ea.
562	Phase Locked Loop	DIP	2.75 ea.
565	Phase Locked Loop	DIP	2.65 ea.
566	Function Generator	MINI DIP	2.75 ea.
567	Tone Generator	MINI-DIP	2.95 ea.

LINEAR INTEGRATED CIRCUITS

100	Pos V Reg (super 723)	TO-5	$ .79 ea.
101	Hi performance AMP	MINI-DIP, TO-5	.32 ea.
101	Voltage Follower	TO-5	.79 ea.
104	Negative Voltage Regul.	TO-5	.89 ea.
105	Positive Voltage Regul.	TO-5	.89 ea.
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109H	5 V Regulator 200 ma	TO-5	1.10 ea.
309K	5 V 1A Regulator	TO-3	1.65 ea.
110	Voltage Follower Op Amp	TO-5	1.19 ea.
111	Hi perf. Volt. Comparir.	MINI-DIP, TO-5	1.05 ea.
119	Hi-Speed Dual Comparir.	DIP	1.29 ea.
120	Neg. Reg. 5, 12, 15	TO-3	1.35 ea.
124	Quad Op Amp	DIP	1.95 ea.
139	Quad Comparator	DIP	1.69 ea.
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170	AGC/Squelch AMPL	TO-5 or DIP	1.15 ea.
172	AF-IF Strip-detector	DIP	.79 ea.
173	AM/FM/SSB Strip	DIP	3.35 ea.
376	Pos. Volt. Regulator	MINI-DIP	.59 ea.
377	2W Stereo amp	DIP	3.69 ea.
380	2 Watt Audio Amp	DIP	1.29 ea.
380-8	.6W Audio amp	MINI-DIP	1.25 ea.
381	Low-Noise Dual Pre-Amp	DIP	1.79 ea.
382	Low-Noise Dual Pre-Amp	DIP	1.79 ea.
550	Prec. Voltage Regulator	DIP	.79 ea.
555	Timer	MINI-DIP	.99 ea.
703	RF-IF AMP	MINI-DIP	.45 ea.
709	Operational AMPL	TO-5 or DIP	.29 ea.
711	Dual Different. Compar.	DIP	.29 ea.
723	Voltage Regulator	DIP	.59 ea.
739	Dual Hi Perf. Op AMP	DIP	1.19 ea.
741	Comp. Op. AMP	MINI-DIP, TO-5	.35 ea.
747	Dual 741 Op Amp	TO-5 or DIP	.79 ea.
748	Freq. Adj. 741	MINI-DIP	.39 ea.
1303	Stereo Pre-Amp	DIP	.89 ea.
1304	FM Multpx Stereo Demod	DIP	1.19 ea.
1307	FM Multpx Stereo Demod	DIP	.82 ea.
1458	Dual Comp. Op. Amp.	MINI-DIP	.69 ea.
LM2111	Dual LM 211 Volt. Comp.	DIP	1.95 ea.
3065	TV-FM Sound System	DIP	.99 ea.
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3900	Quad Amplifier	DIP	.59 ea.
3905	Precision Timer	DIP	.60 ea.
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7525	Core Mem Sense AMPL	DIP	.89 ea.
7534	Core Mem Sense AMP	DIP	2.59 ea.
7535	Core Mem Sense Amp	DIP	1.15 ea.
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75451	Dual Peripheral Driver	MINI-DIP	.39 ea.
75452	Dual Peripheral Driver	MINI-DIP	.39 ea.
75453	(351) Dual Periph. Driver	MINI-DIP	.39 ea.
75491	Quad. seg. driver for LED readout	DIP	1.59 ea.
75492	Hex digit driver	DIP	1.69 ea.

Please specify which data sheets are required with order. Add $.50 per data sheet for items priced less than $1.00 each.

TRANSISTOR SPECIALS

Hi Voltage Power Transistors — Prime Quality

Typically 40 Beta at 50 MHz. 10W, 1A max TO-5

NPN	400 VOLT	$2.45 ea.	With combined
NPN	300 VOLT	1.30 ea.	total of 100
NPN	200 VOLT	.75 ea.	trans — 15% Off

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All items are new, unused surplus parts—tested functional. Satisfaction is guaranteed. Shipment will be made via first class mail — postage paid — in U.S., Canada and Mexico within three days from receipt of order. Minimum order — $5.00. California residents add sales tax.

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ADD A DIGITAL CLOCK TO YOUR SHACK

6 DIGIT CLOCK KIT

Contains — MM5313 — 6 MAN7 — all digit interface IC's and all components needed less pwr xfmr and case $27.95

4 DIGIT CLOCK KIT

Contains — MM5312 — 4 MAN7 — all digit interface IC's and all components needed less pwr xfmr and case $22.95

7-SEGMENT READOUT
12-PIN DIP

- Three digits with right-hand decimal
- Plugs into DIP sockets
- Similar to (LITRONIX) DL337
- Magnified digit approximately .1"
- Cathode for each digit
- Segments are parallel for multiple operation
- 5 - 10 MA per segment **BRAND NEW**

EACH $3.00 4 (12 Digits) $11.00

RCA NUMITRON

EACH.....$ 5.00

SPECIAL: 5 FOR $20.00

DR2010

Potter & Brumfield

TYPE KHP RELAY 4 PDT 3A CONTACTS

24 VDC (650 coil)....$1.50

120 VAC (10.5 MA coil).... 1.75

Power Supply SPECIAL!

723 DIP variable regulator chip 1-40V, + or - output @ 150 MA 10A with external pass transistor--With diagrams for many applications.

EACH....$1.00 10 FOR....$8.95

CT5005 CALCULATOR

This calculator chip has a full four-function memory, which is controlled by four keys, +M (adds entry into memory), -M (subtracts entry from memory), CM (clear memory, without clearing rest of registers), RM (read memory or use as entry).

- 12-Digit display and calculate
- Fixed decimal at 0, 1, 2, 3, 4, or 5
- Leading zero suppression
- 7-Segment multiplexed output
- True credit sign display
- Single 28-pin chip

CHIP AND DATA.....ONLY $14.95

DATA ONLY (Refundable)..... 1.00

5001 CALCULATOR

40-Pin calculator chip will add, subtract, multiply, and divide. 12-Digit display and calculate. Chain calculations. True credit balance sign output. Automatic over-flow indication. Fixed decimal point at 1, 2, 3, or 4. Leading zero suppression. Complete data supplied with chip.

CHIP AND DATA.....ONLY $9.95

DATA ONLY (Refundable).... 1.00

5002 LOW POWER CHIP AND DATA..12.95

All ICs are new and fully-tested; leads are plated with gold or solder. Orders for $5 or more will be shipped prepaid. Add 35¢ for handling and postage for smaller orders; residents of California add sales tax. IC orders are shipped within 2 workdays--kits are shipped within 10 days of receipt of order. $10.00 minimum on C.O.D.s (phone in).

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CTμL SPECIAL:

Complementary Transistor Logic This logic family is unique in that both NPN and PNP transistors are combined in the same package. Unlike TTL and DTL, the outputs are current sources (in the high state) as well as sinking current in the low state. Those are brand new units, some of which are mis-marked with DTL numbers.

CTL 9956 dual 2-input AND buffer
CTL 9953 2-2-3input AND/OR gate
CTL 9952 dual 2-input NOR gate

Data supplied; all parts are dual-in-line.

MIX OR MATCH 5 FOR $1.00

LED's

MV50 red emitting 10-4 ma @ 2V $ .20 10 FOR 1.25

MV5024 red TO-18 high dome $ .35 10 FOR 2.95

MV10B visible red 5-7 ma @ 2V $ .30 10 FOR 2.50

CMOS

CD4001	$ .75	74C20	.75
CD4002	.75	74C160	3.25

3-Amp Power Silicon Rectifiers Marked Epoxy Axial Package

PRV	PRICE	PRV	PRICE
100.....$	.10	800.....$	.30
200.....	.15	1000....	.40
400.....	.18	1200....	.50
600.....	.23	1500....	.65

MAN 1

7-Segment, 0-9 plus letters. Snaps in 14-pin DIP socket or Molex. Operates with IC voltage requirements. Long operating life. ONLY $3.25

7400	$ .25	74L51	$ .30
74H00	.35	74H51	.35
7401	.20	7453	.20
74H01	.35	7454	.25
7402	.35	74L54	.35
7403	.30	74L55	.35
7404	.28	7460	.20
74H04	.35	74L71	.30
7405	.28	7472	.40
7406	.70	74L72	.50
7408	.35	7473	.60
74H08	.35	74L73	.75
7410	.25	7474	.65
74H11	.35	74H74	.80
7413	1.25	7475	1.40
7417	.40	7476	.60
7420	.25	74L78	.80
74L20	.35	7480	.65
74H20	.35	7483	1.00
74H22	.35	7489	4.00
7430	.25	7490	1.20
74H30	.35	7492	.90
74L30	.40	7493	1.15
7440	.25	7495	1.15
74H40	.35	74L95	2.00
7441	1.25	74107	.70
7442	1.20	74121	1.25
7446	1.75	74154	2.30
7447	1.50	74193	1.50
7448	1.50	74195	1.00
7450	.25		
74H50	.35		
7451	.25		

7400 Series DIP

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VARO FULL-WAVE BRIDGES

V5447	2A	400V	$ .90
V5647	2A	600V	1.10
MR810 Rect.		50V 1A	.10

Special 811: Hex Inverter

TTL DIP Hex Inverter; pin interchangeable with SN 7404. Parts are brand new and are branded Signetics and marked "811."

Data Sheet Supplied

EACH.....$ .30
10 FOR..... 2.50
100 FOR.... 23.00
1000 FOR... 220.00

MAN 3

0-9 plus letters. Right-hand decimal point. Flat-pack type case. Long operating life. IC voltage requirements. Ideal for pocket calculators!

EACH $1.25
10 OR MORE 1.00

MAN4

Seven-segment, 0-9 plus letters. Right-hand decimal point. Snaps in 14-pin DIP socket or Molex. IC voltage requirements. Ideal for desk or pocket calculators!

EACH.....$2.75
TEN OR MORE 2.50 EACH

CD-2 Counter Kit

This kit provides a highly sophisticated display section module for clocks, counters, or other numerical display needs. The unit is .8" wide and 4 3/8" long. A single 5-volt power source powers both the ICs and the display tube. It can attain typical count rates of up to 30 MHz and also has a lamp test, causing all 7 segments to light. Kit includes a 2-sided (with plated thru holes) fiberglass printed circuit board, a 7490, a 7475, a 7447, a DR 2010 RCA Numitron display tube, complete instructions, and enough Molex pins for the ICs . . NOTE: boards can be supplied in a single panel of up to 10 digits (with all interconnects); therefore, when ordering, please specify whether you want them in single panels or in one multiple digit board. Not specifying will result in shipping delay.

COMPLETE KIT, ONLY $11.95

FULLY-ASSEMBLED UNIT $15.00

Boards supplied separately @ $2.50 per digit.

LINEARS

NE540	70-Watt power driver amp	$2.00
NE555	Precision timer	1.50
NE560	Phase lock loop DIP	3.25
NE561	Phase lock loop DIP	3.25
NE565	Phase lock loop TO-5	3.25
NE566	Function generator TO-5	4.00
NE567	Tone decoder MINI DIP	4.00
NE567	Tone decoder TO-5	3.00
NE5558	Dual 741 op amp MINI DIP	1.00
709	Popular Op Amp DIP	.45
710	Voltage comparator DIP	.75
711	Dual comparator DIP	.40
723	Precision voltage regulator DIP.	1.00
739	Low noise op amp DIP unmarked	1.00
741	Op amp TO-5/MINI DIP	.55
747	Dual 741 op amp DIP	1.00
748	Op Amp TO-5	1.00
CA3018	2 Isolated transistors and a Darlington-connected transistor pair	1.00
CA3026	Dual differential amp	1.00
CA3045	5 NPN transistor array	1.00
LM100	Positive DC regulator TO-5	1.00
LM105	Voltage regulator	1.25
LM302	Op amp voltage follower TO-5	1.25
LM308	Op Amp TO-5	2.00
LM309H	5V 200 MA power supply TO-5	1.00
LM309K	5V 1A power supply module TO-3	2.00
LM311	Comparator TO-5	1.75
LM370	AGC amplifier	2.00
LM380	2-Watt Audio Amp	1.75
LM1595	4-Quadrant multiplier	2.00
MC1536T	Op Amp	2.00

RGS ELECTRONICS

008A MINICOMPUTER KIT
8008 CPU, 1024 x 8 bit memory; memory is expandable. Kit includes manual with schematic & programming suggestions, wire-wrap board & wiring list, & power supply parts. $375.00
MANUAL ONLY: $25.00

"THE CUBE" Fully assembled subaudible tone generator for small hand-held or portable FM radio. 9–6 volts; no moving parts; set anywhere between 98 & 240 Hz with a trim resistor. .5" x .6" x .7" $ 19.95
Set on frequency by the factory, $5.00 extra.

008A–K ASCII KEYBOARD INPUT KIT
Includes keys, p.c. board, ICs, power supply, instructions, schematic. Intended to interface ONLY with our 008A Minicomputer Kit. $50.00

PS 25–1 0 to 25v 1a lab type power supply with adjustable current limiting; remote sensing & remote programming for voltage & current. Instructions included. All parts except chassis & meter(s). Kit of parts with schematic $14.95

PS 5–1 5v 1a regulated power supply kit with p.c. board & instructions. Board measured 2" x 6"; completed kit is 2" high. Transformer has internal r.f. shield $ 8.00

TTL

7400	$ .25	7485	$1.40
7401	.25	7486	.50
7402	.25	7489	3.25
7403	.25	7490	1.00
7404	.30	7492	1.00
7405	.30	7493	1.00
7406	.50	7495	1.00
7407	.50	7496	1.00
7408	.30	74107	.60
7409	.30	74121	.60
7410	.25	74122	.60
7411	.30	74123	1.10
7413	.90	74125	.65
7416	.50	74126	.65
7417	.50	74141	1.25
7420	.25	74150	2.50
7430	.25	74151	1.10
7432	.30	74153	1.40
7437	.50	74154	1.70
7438	.50	74157	1.40
7440	.25	74161	1.90
7442	1.10	74163	1.90
7446	1.45	74164	2.00
7447	1.45	74165	2.00
7448	1.45	74166	2.00
7450	.25	74174	2.20
7451	.25	74175	2.20
7453	.25	74176	1.60
7454	.25	74177	1.60
7473	.50	74181	4.50
7474	.50	74192	1.75
7475	1.00	74193	1.50
7476	.65	74195	1.15
7483	1.25	74200	9.00

TRANSISTORS	1–9	10+
NPN TO–18 gen. purpose silicon	$ .15	$ .10
PNP TO–18 gen. purpose silicon	.15	.10
2N2222 (NPN) TO–18	.25	.20
2N2907 (PNP) TO–18	.25	.20

JUNCTION FETs, TO–18 case

N–CHANNEL:	SIMILAR TO:	
NJF10	2N4416, MPF102	3/$1.00
NJF11	2N4091–93	4/$1.00
NJF12	2N4338–41	4/$1.00
NJF13	2N3089	3/$1.00
NJF14	2N4221–22	4/$1.00
P–CHANNEL:		
PJF11	2N3382–86	4/$1.00
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All FETs come with data sheets.

NEW – GOOD – PLASTIC TRANSISTORS
TO–92 general purpose NPN & PNP transistors,
beta > 100, breakdown > 40v
$ .08 each $5.95/100
Specify type and quantity.

WIRE WRAP SOCKETS

14 pin	$ .55
16 pin	.65
24 pin	1.30
28 pin	1.40
40 pin	1.85

wire-wrap socket pins
$ .05 $4/100

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LED 10R – Ten discrete red lens LEDs, various MV5020 types $1.50
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The clear, simplified instructions include step by step construction procedures and ample illustrations which will quickly take you through construction of this versatile Clock/Calendar.

THE KIT FEATURES:

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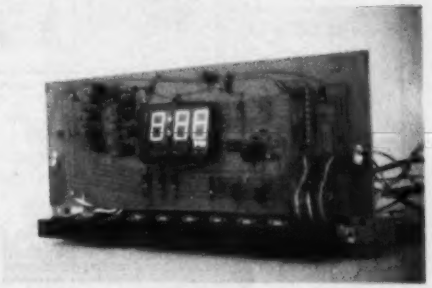
An attractive case may be fabricated of wood, plexiglas, metal or whatever you feel would make an appropriate show-case for your finished kit.



PLEASE NOTE: These kits do not include cases.

This kit when completed is a sophisticated device which offers many additional features due to its flexibility, here are two examples of what can be done with this device:

1. You may set the timer to play your radio for 15 minutes at bedtime, then the alarm allows you the option of waking up to the radio in the morning all automatically.
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TO ORDER:

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21G2102/2602 N CHAN Bit static RAM.

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74C04	.85	CD4013	1.10	CD4049	1.10	723T	.95
74C10	.60	CD4014	4.00	CD4050	1.10	723D	.75
74C20	.60	CD4015	4.00	CD4116	1.25	741M	.45
74C73	1.65	CD4016	1.10	**LINEAR**		741T	.50
74C74	1.25	CD4017	3.20	LM301M	.45	747D	.75
74C76	1.75	CD4018	3.25	LM311M	.95	748M	.50
74C107	1.75	CD4019	1.25	LM318	1.75	1595	1.50
74C151	3.30	CD4020	3.50	LM339	1.50	1596	1.75
74C160	3.25	CD4021	4.00	LM370	1.25	CA3028	.75
74C161	3.25	CD4023	.55	LM371	1.25	CA3065	.75
74C162	3.25	CD4024	2.75	LM372	1.25	CA3086	.45
74C163	3.25	CD4025	.55	LM374	2.00	3900	.65
74C195	3.15	CD4027	1.50	LM380	1.65	4136	1.95
CD4001	.55	CD4029	6.00	LM381	1.75	4250T	2.25
CD4002	.55	CD4030	.55	LM382	1.75	5556M	1.50
CD4008	4.00	CD4035	2.50	LM399	1.75	5558	.75
CD4009	.75	CD4037	2.95				
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Include 50¢ postage and handling on orders under $10.00

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HT-144B

TWO METER F.M. PORTABLE

See p. 16 for New Product Review

CRYSTAL SOCKETS INCLUDED!
IMPROVED TRANSMIT AUDIO!
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.35 uV SENSITIVITY OR BETTER!
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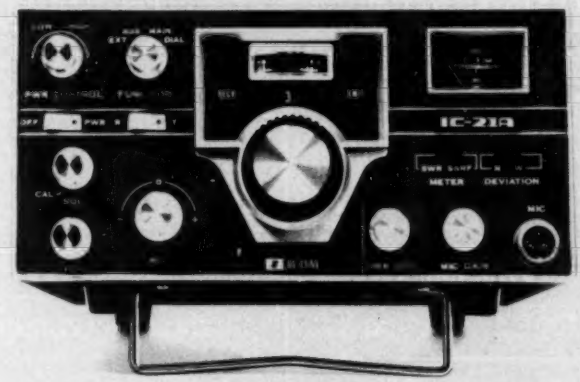

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IC-22 . . . 22 channel capacity, with 5 supplied. Solid state T-R switching, and an extra large speaker. All the great quality features that label it as one of the truly fine ICOM transceivers. 10/1 watt power saving option. Trimmer caps on all 22 channels for both transmit and receive, plus a built in discriminator jack to let you get on and stay on frequency.

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CALCULATOR KIT

Kit contains NORTEC calculator chip 4024.21 driver transistors, 8 LED's, 7 segment readout by EXITON, 1 LED for overflow, low bttry, over range, a keyboard by FLEX KEY. All this $45 value for only $16.50 2 for $27

BASIC CLOCK KIT

We furnish clock chip CT7001 and 4 first line LED readouts, 1 inch hgt. You furnish the misc. minor parts. A $35 value for $19.95

LIQUID CRYSTAL WATCH

Build a wrist watch or desk clock with this liquid crystal display. Recently written up in several magazines. Display with special socket reads hours and minutes $15 2 for $25

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Brand new by OLIN. Use it for a swim pool monitor alarm, use it on lake or ocean listening to underwater noises, fish, etc. Complete with hydrophone, 50 ft. mike cable, speaker amplifier console. Operates from 115 volts AC or 15 volt dry cells. 12 lbs. $25

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5001 LSI (40 pin) Add, subtract, multiply, divide 12 digit. With data $6.95
Data alone 50 cents

CMOS 4814 HEX INVERTER

CMOS HEX INVERTER, dual inline package, 3-18 volt range, dual diode protection against static charge. Dielectrically isolated complimentary MOS. $1.00 each 12 for $10.00

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Dual 16 bit memory, serial MOS by Philco TO 5 case, brand new with 2 page specs.
=PLR 532 $1.00 each $10/12

AM-FM RADIO $5.50

Due to the West Coast ship strike they came in too late for the customer. Now it's your bargain. Use it as is or build it into your own cabinet, desk, wall, etc. All built, ready to use, with AC supply. To make it portable all you do is power it with a couple of "D" cells. Fully assembled solid state chassis with AC power supply, less speakers. Covers full AM as well as FM broadcast. The price ... an astounding meager $5.50

FLEX-KEY KEYBOARD FOR POCKET CALCULATORS $1.50

POWER AMP XFMR 380 WATT

115 volt input, 64 VCT 6 amp output.
$11.95 each, 2/$22, 5/$50

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Solid state SQ 4 channel adapter, 2 amps built in. Decodes 4 channel or synthesizes 4 channel. $35.00

LED READOUTS 5/$1.00!

The price is not a mistake. We have some hobby variety with some segments out. Ukinbuyem for as low as 5 for $1.00

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For use with most Instamatic cameras. With nicad battery and built-in charger. Never buy flash cubes again. $9.95

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For console installation, w/face plate, no knobs. Stereo amplifiers for tape or turnable playback $15.00
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CALCULATOR CHASSIS

Fully assembled pocket calculator chassis with calculator chip. Uses LED readouts, not included. $5.00

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Giant cell 2" diameter — $1.50
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Any six for the price of 5

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SLA-13	GREEN
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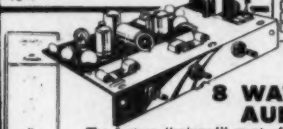

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SN7404	.27
SN7405	.24
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SN7407	.48
SN7408	.27
SN7409	.27
SN7410	.22
SN7411	.31
SN7412	.58
SN7413	.89
SN7414	2.25
SN7415	.45
SN7416	.45
SN7417	.50
SN7420	.32
SN7421	.50
SN7422	.39
SN7423	.32
SN7425	.35
SN7426	.31
SN7427	.35
SN7430	.24
SN7432	.35
SN7437	.45
SN7438	.49
SN7440	.22
SN7441	1.19
SN7442	1.02
SN7443	1.02
SN7444	1.02
SN7448	1.09
SN7446	1.19
SN7447	1.19
SN7448	1.19
SN7450	.27
SN7451	.28
SN7453	.28
SN7454	.29
SN7455	.28
SN7460	.26
SN7461	.26
SN7462	.39
SN7464	.39
SN7465	.39
SN7470	.49
SN7471	.55
SN7472	.42
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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	7	3	3	3	7	7	14	14	14
ARGENTINA	14	7B	7B	7B	7	7	14	21	21	21	21	21
AUSTRALIA	14	7B	7B	7B	7B	7B	7B	14	14B	14B	14	21
CANAL ZONE	14	7	7	7	7	7	14	14A	21	21	21	14A
ENGLAND	7	7	3	3	7	7	14	14A	14A	14	14	7
HAWAII	14	7B	7B	7	7	7	7	7B	14B	14	14A	14A
INDIA	7	7	7B	7B	7B	7B	14	14	7B	7B	7	7
JAPAN	14	7B	7B	7B	7	7	7	7	7	7B	7B	14
MEXICO	14	7	7	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14	7B	7B	7B	7B	7B	7	7A	7	7B	7B	7B
PUERTO RICO	7	7	7	7	3A	3A	14	14	14	14	14A	14
SOUTH AFRICA	7	7	7	7	7B	14	21	21	21	21	14A	14
U. S. S. R.	7	3	3	3	7	7B	14	14	14	14B	7B	7
WEST COAST	14	7	7	7	7	3A	7	14	14	14	14A	21

CENTRAL UNITED STATES TO:

ALASKA	14	7A	7	7	3	3	3	7	7	14	14	14
ARGENTINA	14	7B	7B	7B	7	7	7B	14	21	21	21	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	7	14B	14B	14	21
CANAL ZONE	14	7	7	7	7	7	7	14A	21	21	21	21
ENGLAND	7	7	3	3	7	3	7B	14	14	14	14	7
HAWAII	14A	14	7	7	7	7	7	7	14B	14A	21	21
INDIA	7	7B	7B	7B	7B	3B	3B	7	7A	7	7	7
JAPAN	14	14B	7B	7B	3A	7	3	7	7	7B	7B	14
MEXICO	14	7	7	7	7	3	7	7A	14	14	14	14
PHILIPPINES	14	14	7B	7B	3B	7B	3B	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7A	14	14A	14A	21	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14A	14
U. S. S. R.	7	3	3	3A	7	3A	7B	14	14	7B	7B	7B

WESTERN UNITED STATES TO:

ALASKA	14	7A	7	7	3	3	3	7	7	7A	14	14
ARGENTINA	14	14	7B	7B	7	7	7B	14	21	21	21	21
AUSTRALIA	21	21	14	7B	7B	7B	7B	7	7	7B	14	21
CANAL ZONE	14	7A	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	7	3	3	7	3	3B	7	14	14	14B	7B
HAWAII	21	21	14	7	7	7	7	7	7A	14A	21	21
INDIA	7	14	7B	7B	3B	3B	3B	7	7	7	7	7
JAPAN	14	14	14B	7B	3A	7	7	7	7	7B	14B	14
MEXICO	14	14B	7	7	7	7	7	7A	14	14	14A	14A
PHILIPPINES	14	14	14	7B	7B	7B	7	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	14	14A	21	21
SOUTH AFRICA	7B	7	7	7	7B	7B	7B	14	14	14	14A	14
U. S. S. R.	7	3	3	3A	3	3	3	7	7A	7A	7B	7B
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A = Next higher frequency may be useful also.
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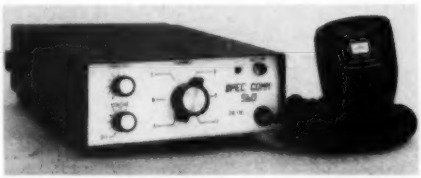

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